AD-A143 617 NEEDS ASSESSMENT TO DEFINE THE TRAINING REQUIREMENTS FOR A BASIC SKILLS E..(U) RCA SERVICE CO CHERRY HILL NJ JUN 84 DABT60-81-C-0017 1/2

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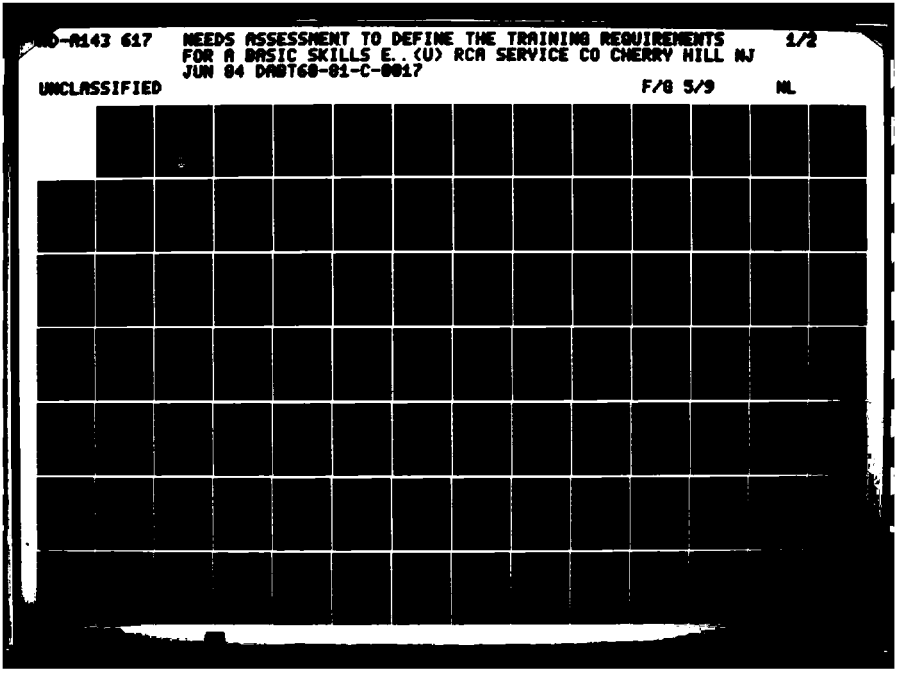

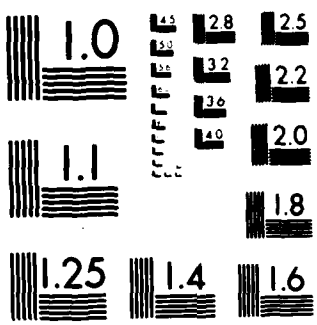

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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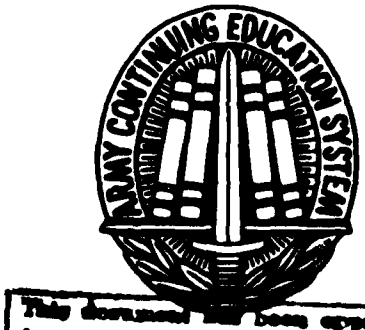
NEEDS ASSESSMENT TO DEFINE THE TRAINING REQUIREMENTS FOR A BASIC SKILLS EDUCATION PROGRAM (BSEP) CURRICULUM DEVELOPMENT

EXECUTIVE SUMMARY

Submitted to the TRADOC
Education Division by
RCA Service Company
Cherry Hill, NJ
Reference Contract
DABT 60-81-C-0017



June 1984

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Scientific and Technical Report

Executive Summary (Phase I)

CDRL Sequence No. A013

of

Contract DABT60-81-C-0017

by

RCA Service Company

Revised April 1984

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Requirement of Report

The requirement for development of this executive summary is stated in CDRL Sequence Number A013, Attachment 4 to Modification P00006 of Contract DABT60-81-C-0017. Since Phase II is scheduled for completion by 31 July 1983 and Phase III by 31 December 1983, this report describes the effort associated with analysis and related work for 94 MOS and common tasks. A full description of the required effort is given in the subject contract, including Modifications P00001 thru P00007.

Statement of Performance

RCA Service Company of Cherry Hill, New Jersey was the prime contractor for Contract DABT60-81-C-0017. The following subcontractors were utilized for the role listed:

1. Educational Testing Service of Princeton, New Jersey was responsible for test development and tryout activities.

2. Paradigm, Inc. of Potomac, Maryland was responsible for conduct of activities and development of reports associated with the Initial Entry Course Survival Skills analysis effort.

3. Florida State University, Center for Educational Technology of Tallahassee, Florida assisted with revisions to the Extended Task Analysis Procedures manual and provided two weeks of training for the initial cadre of field analysts.

4. Temple University, Psychology of Reading Department of Philadelphia, Pennsylvania assisted with extended analysis of reading - related prerequisite competencies.

5. Braedon Hill, Inc. of Richmond, Virginia provided analysis services at Ft. Devens and Ft. Eustis.

Definition of Terms

Throughout this report certain terms are used to express the original or operationally defined intent of processes or products. These terms and their respective definitions are provided at Attachment A.

Statement of Purpose

The purposes and goals of the project effort are defined as follows:

1. Identify and functionally tie prerequisite competencies and basic skills to MOS performance requirements via a uniform process of extended task analysis.

2. Facilitate the diagnosing and prescription of needed remedial training for identified prerequisite competencies and basic skills through the development of skills profiles and diagnostic tests.

3. Provide descriptions, models, and specifications for remedial training programs so identified prerequisite competency and basic skills deficiencies can be remediated on an individual basis.

Throughout this document the degree to which the purposes and goals were achieved is discussed. The final section provides conclusions and recommendations in terms of the stated goals.

Format of Report

In addition to the sections included above, the report contains the following sections: Startup, Analysis, Test Development, Clustering, Curricula Model, Curricula Design Specifications, and Conclusions and Recommendations. As appropriate, sections are subdivided to provide discussion of activities, results, and other reports.

Startup

Startup covered the timeframe of 6 April thru 8 June 1981 and included general and specific activities associated with initial project work events.

Activities. Major startup activities are identified and briefly discussed as follows:

1. Completion of initial project organization and plans. The following three plans were developed: Contract Performance Plan (CPP), Quality Assurance Plan (QAP), and Verification Plan (VP). The major areas addressed by these plans were: timelines for major and sub-work events; quality assurance procedures, beyond normal management practices; and procedures for verifying (substantiating) task analysis results. These plans received substantial modification via subsequent contract communications.

2. Establishment of liaison relationship between contractor and Government personnel. Because the work effort was geographically dispersed this activity was viewed as critical for project communications and ultimately for project success. Areas of action included: extensive telephonic contacts between Project Manager and Contracting Officer Representative (COR); conference calls to analysis sites; personal briefings by Project Manager and COR at each analysis site; and orientation packages for use during training sessions. It should be noted that the process of establishing effective relationships between contractor and Government personnel continued throughout the project timeframe. This was necessary because of three main factors. First, project activities were scheduled for initiation on a phased basis. Second, as the project developed processes and procedures were further refined and/or modified. Consequently, information had to be provided to supplement initial briefings. And third, Government personnel were rotated and there existed a need to brief newly assigned personnel.

3. Receipt and cataloging of Government Furnished Materials (GFM). The primary GFM received was Soldier's Manuals (SM) or Task Lists (TL) for each Military Occupational Specialty (MOS) and for common tasks. During this activity it became apparent that TRADOC proponents preferred to view the GFM as an initial submission and to provide more current GFM as the project progressed. This preference was accommodated and the authority to update GFM was included in a contract modification. This decision helped assure the currency and relevancy of analysis results.

4. Completion of staff orientation and training programs. Staff orientation and training included the following phases: general orientation; specific training for task analysis; and general informational briefing on U.S. Army practices and protocol. Orientation was a three-day session conducted by the contractor. Emphasis was placed on the following: project overview and organization; task list and Soldier's Manual terminology, structure, and content; planning for task analysis; overview of the Extended Task Analysis Procedures (ETAP); and plans for project communications. Specific training for task analysis was conducted during a ten-day period at Florida State University. Instruction and practice were included for the following: interviewing skills, procedural analysis, mixed analysis, data recording, extended analysis, and analysis planning. Sixteen (16) contractor and and sixteen (16) Government personnel participated in the training.

Reports. Pertinent reports resulting from the startup activities were as follows:

1. Contract Performance Plan, CDRL Sequence Number A001.

2. Quality Assurance Plan, CDRL Sequence Number A002.

3. Verification Plan, CDRL Sequence Number A003.

4. Letter Progress Report of 15 June 1981 with analysis planning guide attached.

5. Letter Progress Report of 15 July 1981 with training schedule attached.

Analysis

A two-part analysis effort covered the timeframe of 1 May 1981 to 31 December 1982. One part of the analysis effort addressed identification of Initial Entry Training Course Survival Skills (IETCSS). The other part involved extended task analysis for skill level-10 and skill level-20 in 94 MOS, plus common tasks contained in FM 21-2 and FM 21-3, dated May 1981. Parts of the analysis effort are described in separate subsections below.

IETCSS Activities. Work on the IETCSS effort covered the timeframe of 1 May 1981 to 31 December 1981. Major work activities included the following:

1. Based on the definition of IETCSS and contract requirements to conduct the effort at eight (8) locations, decisions were made concerning selection of specific MOS for study. The twenty-five (25) MOS selected are identified at Attachment B. Selection factors included the following: MOS technical content, MOS density, geographical location, mode of instruction, and academic attrition rate.

2. Consideration and selection of data sources. Data sources were as follows: literature search, consultation with authorities, students, instructors, instructional materials, and training processes.

3. To operationalize the data collection effort instruments were developed for student interviews, instructor interviews, student surveys, instructional materials review, and training observation. Though developed, the training observation form was not utilized due to lack of availability of technical assistance personnel and results obtained from tryouts of student and instructor interview formats.

4. For each study MOS, optimum sample sizes for respondents were set as follows: student interviews - 10 students; student surveys - 60 students; and instructor interviews - 5 instructors.

5. To further define the student sample, "marginal students" were identified. "Marginal students" were defined as meeting any one of the following requirements: attendance in BSEP program, recycle through target lesson(s) or course for academic reasons, or rank in the bottom 20% of the class.

6. A final refinement to the study methodology involved identifying target lessons. Target lessons were those points in the MOS training at which students were having the greatest difficulty, as evidenced by: greatest number of recycled students; greatest number of attrited students; greatest counseling or remediation effort required; greatest number of NO-GO's in testing; or highest Student Progression Index (for self-paced courses only).

IETCSS Results. Results for the IETCSS effort are in terms of fulfillment of study design requirements and interpretation of data from the several main sources. A major statement of results is provided below for each area. Supporting substatements are also provided.

1. Major descriptive statistics for the student sample are as follows: Regular Army service - 65%; high school graduates - 62%; race - 63% white, non-Hispanic; sex - 86% male; attendance in BSEP - 12%; recycled in course - 7%.

2. Due to time and other administrative constraints, most sample sizes were reduced for student surveys. In all but a few select cases sample sizes were maintained for student interviews and instructor interviews.

3. All eight training locations involved in the study supplied the requested instructional materials for review. A range of written and audio visual materials were included; however, instructor-based materials were not reviewed.

4. Early in the study, especially in the open-response format of the student interview, it was determined that some responses could not be expressed in terms of IETCSS. These responses, because they represented student problems, were termed learning barriers. Examples include: cannot hear instructor while instruction is presented outdoors, cannot see demonstration because group is too large; not enough sleep; too hot or cold in training area; and not enough time to learn everything.

5. Results identified for the IETCSS effort were in most cases a unique blend of the requirements of the technical training and the selected method of instruction. However, the following common threads can be synthesized from the data:

   a. in Reading and comprehension: gaining the main idea; obtaining a detail; following written sequential information; and understanding common civilian vocabulary.

   b. in Mathematics: addition, subtraction, multiplication, and division of whole numbers; handling fractions -- operations, conversions, and sequencing; and manipulating simple formulae.

   c. Visual comprehension: following or remembering a sequence of steps shown in a demonstration and relating a picture to a real situation.

   d. Writing: being able to spell and copying material verbatum.

   e. Listening: gaining a main idea; following or remembering a set of directions given orally.

   f. Study/work skills: concentration; memorization; attention to detail; taking notes; relating notes to course materials.

6. With due caution concerning sample sizes, it is important to note that a significant question arises when data for the subsample of "marginal students" is compared with data for all other students. The question is: If both groups report the same problem e.g., following written sequential information, is the "problem" with the student or with the "written sequential information?" This question cannot be answered in a single manner for the complete IETCSS effort. The best answer appears to that attention should be given to student remediation of IETCSS and to refinement and restructuring of instructional materials and to study/work skills.

IETCSS Reports. Reports resulting from the IETCSS effort were as follows:

1. Preliminary Initial Entry Training Course Survival Skills Report, CDRL Sequence Number A012.

2. Final Initial Entry Training Course Survival Skills Report, CDRL Sequence Number A005. (Includes lists of IETCSS, CDRL Sequence Number A004.)

Task Analysis Activities. Work on the task analysis effort covered the timeframe of 1 May 1981 to 31 December 1982. Major work activities included the following:

1. As a startpoint for the task analysis activities the Extended Task Analysis Procedures (ETAP) were provided as GFM. Following a review for internal consistency and clarity of presentation, the ETAP were field tested at Ft. Belvoir. The following resulted from the pretest: simplification and redefinition of terminology; establishment of initial descriptions for Subject Matter Expert (SME) qualifications; development of initial procedures for analysis planning sessions; and specification of initial data recording procedures.

2. Staff training, as described above in the Startup section, was completed for the group of analysts initially assigned to field locations.

3. Establishment and conduct of analysis activities at various locations. The first complement of analysts reported to five (5) field locations. Additional locations were activated as the project progressed. Information at Attachment C shows how the analyst work force was built up and phased down. A common scenario for startup and conduct of task analysis activities at the various locations was as follows:

   a. Initial information briefing by Project Manager and COR. Very often at least two briefings were held for personnel at various levels in the TRADOC school directorates. Also, as the project progressed, analyst personnel were included in portions of the briefings.

   b. Additional briefings by the TRADOC-designated Point of Contact (POC). The most important briefings were held at source that would supply SME and GFM.

   c. Establishment of work locations and work schedules. An extreme amount of flexibility was used in these areas. As a guideline face-to-face contact between analyst and SME was four (4) hours per day.

   d. Conduct of initial analysis planning sessions. Issues handled at these sessions included: verification that SM or TL was current; review and plans for obtaining support GFM, such as Technical Manuals, Field Manuals, Supply Bulletins, Regulations, and Directives; review and sequencing of tasks for analysis.

e. Dependent upon availability of personnel, work schedules, and number of analysts at a particular location, analysis, substantiation, verification, and instructional review sessions were alternated (see discussion below).

4. Conduct of task analysis included sessions for analysis, substantiation, verification, and instructional review. The purpose and structure of each type of session is briefly described below.

   a. Analysis sessions served the purpose of gathering the basic task analysis and prerequisite competency information. In most instances information was gathered by face-to-face interviews between an analyst and SME. These interviews were often augmented by review of GFM, observation of task-related training, or SME demonstration of portions of the task. Most commonly the interviews were followed by data recording sessions during which the analyst worked alone.

   b. Substantiation sessions (procedures) were used so the initial SME could review data recorded by the analyst. These procedures were commonly incorporated with interview sessions. Telephone sessions were also used frequently.

   c. Verification sessions provided an opportunity for an independent review of the task analysis and prerequisite competency information. A second SME or group of SME was used for verification. Matters of differences between the interview results and verification results were resolved by the analysts. In a limited number of instances, both results were reported.

   d. Instructional review sessions were used to determine if task procedures and prerequisite competencies were instructed during technical training. This process was the main attempt to establish baseline prerequisite competencies. Instructor personnel, in many instances the same person who had performed the verification, were used in these sessions.

5. Integral to the task analysis process was the development and utilization of a taxonomy of prerequisite competencies. A taxonomy fulfilled a requirement contained in the ETAP manual and served to add breadth and standardization to the process of identifying prerequisite competencies. Development and utilization of the taxonomy proceeded along the following lines:

   a. Based on a review of relevant GFM, definitions contained in the subject contract, issues addressed during analyst training, and consultations with the COR, initial taxonomy categories were identified and provided as part of the data recording forms used by analysts. The categories provided a gross coding scheme that could be used with results from the knowledge analysis step of the ETAP manual.

b. Using ETAP results and follow-on discussions with the COR, the beginning categories were expanded by inclusion of additional major categories and subcategories. By 31 July 1981 the first expansion of the taxonomy had been fielded. It contained fifteen (15) categories and ninety-three (93) subcategories. Analysts continued to write statements from the knowledge analysis step of the ETAP and to code the statements in accordance with the taxonomy.

c. By 15 May 1982 the taxonomy had been expanded to thirty-six (36) major categories and two hundred (200) subcategories. At this time analysts began coding results directly onto data recording forms.

Task Analysis Results. Results of the task analysis effort can be expressed in terms of both the concepts, issues, and processes encountered and engaged in and the data and products produced. Data and products are described in the next section, the remainder of this section is devoted to concept, issue, and process results.

1. An optimum circumstance exists for task analysis when the input units are equivalent as to amount of activity subsumed, level of definition, and specificity of expression, i.e., tasks are equivalent units of job performance. TRADOC Pamphlet 350-3 provides guidance in terms of defining a task and describing and giving examples of task components. Optimum circumstances did not exist however for the current task analysis efforts. Extremes can serve to highlight the operational situation. In one MOS fifteen (15) tasks were used to describe complete job performance and a majority of the tasks were coded as appropriate to skill levels 1-4. In another MOS more than five hundred (500) tasks were contained on the task list. The significance of noting this diversity is to demonstrate that responsibility for fully defining and delimiting tasks often fell to the analyst and SME during the analysis sessions.

2. Another assumption at the beginning of the current task analysis effort was that all tasks were equivalent with regard to SME knowledge of performance. However, it became obvious quite early in the process of analysis that different "types" of tasks often equated to different levels of knowledge on the part of SME. Operational terminology was quickly developed for the various "types" of tasks. This terminology served as an avenue of communication on the current effort and may have relevancy in a larger context. The terminology developed was as follows:

   a. "Old common task." Prior to the issuance of the Common Task Soldier's Manual each proponent school included common tasks on any task list developed. Therefore, when the current task analysis effort was initiated, many TL and SM contained "old common tasks." In most instances, at the request of the proponent school, these tasks were not analyzed. This circumstance explains, in large part, why the number of tasks to be analyzed was reduced significantly below the original count of approximately 14,500.

b. "Nonproponent shared task." In this case a task developed for an MOS at one proponent school is used in an MOS at a different proponent school. An example would be using a MOS 64C task in MOS 16H.

c. "Proponent shared task." In this case a task is used in more than one MOS at the same proponent school. An example would be in MOS 11B, 11C, and 11M at Ft. Benning.

d. "MOS unique task." A task developed for use in only one MOS.

3. Task analysis results must be viewed in terms of the sources of variance which existed at the time they were obtained. Two sources of variance, task description and "type" of task, were noted above. Other sources of variance were as follows:

a. Technical knowledge and communication skills of SME. A total of 1,443 SME were interviewed as part of the task analysis effort. Considering that the ETAP called for both original interviews, verification, and instructional review, this computes to an "average" of approximately ten (10) task per SME. The main reasons for this "low average" were administrative, i.e., all SME were released from regular duties for this effort and consequently were scheduled back on their regular duties even if they were performing adequately as SME. Other reasons had to do with technical knowledge and communication skills of the SME. Most frequently requests to replace SME had to do with efficiency of operation, rather than a complete lack of technical knowledge or communication skills. In other words, some SME had limited experience and some had limited communication skills, so they were replaced with more capable SME.

b. Level of detail required or desired in the analysis results. Of ten, throughout the intensive period of task analysis, personnel needed reminders that a dual focus analysis product was being developed. The first focus was on the technical aspects of the task -- the actions a soldier performs. The second focus was on the identification of prerequisite competencies -- the skills and knowledges that allow a soldier to perform technically. The need for the reminder was precipitated by attempting to answer the question: When is a task completely analyzed? Answers such as, when all the action steps have been identified or when all the prerequisite competencies have been identified, appeared incomplete. Also, attempts to define "entry level soldier" or "lowest ability soldier" were inadequate. The effort finally settled on a relative answer that included the concepts mentioned above plus generous examples of analysis results. Unfortunately, relative answers are open to analyst interpretation and thus constitute another source of variance.

c. Maintaining a field orientation to the analysis activities. The following represents a continuum of analysis techniques: Observation of task performance, interview/demonstration of task at the job site, interview/demonstration of task in the proponent school setting, panels of experts, surveys of job incumbents, examination

of GFM and doctrine, intuition. While some may argue about placement of certain techniques on the continuum, it can be seen that the current effort used a technique that was "middle-of-the-road." Therefore, special approaches were used in an attempt to maintain a field orientation. Introduction of the discrepancy report (see next section on products) assisted with this effort.

d. MOS turbulence and areas of doctrinal concern. The following is strong, yet verifiable, statement: Each MOS is characterized by turbulence and areas of doctrinal concern and the analysis results represent this situation. Many areas of turbulence are widely recognized, but others are more subtle. An example of a subtle area has to do with analyzing the use of GFM, such as TM and FM. In many instances use of TM and FM are viewed as integral to task performance when in fact task conditions prohibit their use. In such cases GFM is best viewed as a resource and not as an instrinsic job aid. The current analysis effort attempted to sort through the task information and to make these destinctions. Again, an error source exists because resources were not adequate to address all areas of turbulence and doctrinal concern.

4. An objective of the current task analysis effort was the identification of MOS baseline skills. The baseline was conceptualized as a zone of demarcation -- below the baseline skills were assumed to be prerequisite; they were not instructed as part of normal training; the baseline was the assumed entry behavior level. The process for determining the baseline was instructional review. Instructional review was performed by a knowledgeable individual who reported whether skills were taught or not taught. Several major problems were encountered with the process. First, identification of knowledgeable persons was difficult -- most persons at a proponent school have detailed knowledge of only a portion of the POI, especially at the prerequisite competency level. Second, the process could not be applied to BSEP II tasks since no resources were available from unit training environments. And third, no reasonable criteria could be established for whether a skill was taught or not taught. Criteria considered included: mention in the POI; stated in a lesson plan; contained on a test; required mastery on a test. The effort did gather information through interviews as to what actions or prerequisite competencies were taught and not taught and the information has been reported. Prior to using the information additional verification is recommended.

Task Analysis Reports. Task analysis reports were extensive. Attachment D provided a diagram showing derivation, an explanation of contents, and a listing of reports.

Test Development

The test development effort covered the timeframe of 1 June 1981 to 15 January 1983. The effort consisted of three (3) major areas of work: item development, item pretesting and final form assembly. The products produced are currently being submitted to an initial validation study which will culminate in December 1983.

Test Development Activities. Test development efforts were carried out concurrently with task analysis activities. Major work activities included the following:

1. Defining the structure of the diagnostic tests. Based on the requirements of the subject contract, it was decided that the diagnostic tests would consist of a collection of short subtests (approximately ten (10) items each) on an MOS-by-MOS basis. Tests were planned for BSEP I and BSEP II tasks.

2. Defining the input of the diagnostic tests. It was evident from the initiation of the effort that input for test development was to come from the task analysis effort. The major issue confronting test developers was the amount of transformation that was needed so analysis results could be used for item development. Criteria established included the following:

   a. Input statements should be specific enough to lead to development of a subtest -- approximately ten (10) items. If input statements were at some other level of specificity then test developers either had to combine or divide the statements.

   b. Input statements should be mutually exclusive. This criterion was important because it helped reduce questions of redundancy or overlap between subtests.

   c. Input statements should be objectively stated in measurable terms so as to reduce ambiguity for item developers.

   d. Input statements should reflect behavior that could be assessed in a paper-based, multiple-choice format.

   e. Input statements should be arranged in an hierarchical manner so test branching algorithms could be developed.

3. Defining the context and level of difficulty of the test items. At the initiation of the test development effort context clues were taken from samples of MOS content. Samples were drawn primarily from GFM which were identified as resources or intrinsic job aids during task analysis activities. Level of difficulty was arbitrarily set at a low level to account of anticipated reading difficulties on the part of test takers.

4. Following the guidelines established in #1, 2, and 3 above, item development proceeded through December 1981. At that time a reassessment was made of the test development process. The following concerns were noted:

   a. Proceeding on an MOS-by-MOS basis was a very costly undertaking and it was evident that resource constraints would prohibit full development under this approach.

   b. Proceeding on an MOS-by-MOS basis was a very time consuming process which required that all analysis be accomplished for a specific MOS prior to knowing if test development was complete.

c. Analysis results provided only clues to hierarchical arrangements of input statements and it became clear that the effort necessary to establish hierarchies would significantly add to the development time.

d. Analysis results were expressed at varying levels of specificity and thus input statements required extensive review and work by test developers prior to being usable by test developers.

5. Based on the considerations noted above, adjustments were made to the test development process in January-February 1982. The approach to development included the following:

a. To accommodate concerns regarding hierarchies it was decided to develop two (2) locator tests. Results from the locator tests could then be used to predict results on subtests and subsequently, in operation, a student may bypass many of the subtests.

b. Simultaneous with expansion of the taxonomy a consolidated list of test development objectives was produced. These objectives met many of the criteria described above. The objectives were also coded to the expanded taxonomy.

c. Input for test development was in terms of taxonomy statements on an MOS-by-MOS basis.

d. Item context was changed from MOS to Army.

e. Test items were developed for taxonomy entries (objectives) and were used across as many MOS as applicable for both BSEP I and BSEP II.

6. Test items were assembled into pretest formats and pretested on samples of IET students and reviewed by expert judges. Pretesting was scheduled for up to 300 students per item. Students were used for a four (4) hour block of time, including administration of a locator test.

7. Following analysis of pretest data and review of information from judges, test items were assembled into final test forms.

Test Development Reports. Products from the test development effort are listed below and are all in response to CDRL Sequence Number A007 of the subject contract.

1. Mathematics and verbal locator tests and scoring keys.

2. Sixty-nine (69)mathematics subtests and scoring keys. Complete listing of titles at Attachment E.

3. Fifty-nine (59) verbal subtests and scoring keys. Complete listing of titles at Attachment E.

4. Item analysis data for verbal and mathematics pretests.

5. Statistical summary sheets for verbal and mathematics final forms.

6. Prediction charts for use with locator tests and subtests.

7. Individual record sheets for each MOS.

8. User's guide.

Clustering

Clustering activities were pursued on an intermittent basis during the timeframe of September 1981 through June 1983. Activities followed a test, interpretation, and retest cycle.

Clustering Activities. Major work activities associated with the clustering effort were as follows:

1. Defining the purpose or intent of clustering. As stated in the subject contract, MOS clustering was envisioned as a procedure that could consolidate analysis data for use in a more parsimonious curriculum development effort. Parsimony was described in terms of curriculum design, development, and delivery. The primary focus was on determining the extent to which a clustering solution could assist with curriculum design.

2. Defining and selecting the input to clustering. As prescribed by the subject contract, one input to clustering was MOS designation. While other factors were considered it was determined that a second input would be prerequisite competency statement code. Another portion of the effort was devoted to attempting to determine whether the input should be in terms of nominal data (occurrence or nonoccurrence of prerequisite competency statement) or ratio data (percentage of frequency of occurrence of prerequisite competency statement).

3. Selecting the clustering methodology. As reported in the professional literature several acceptable methodologies for clustering exist. Each methodology is appropriate for the present situation, when factors such as measurement assumptions, verifiability, and validity of results are considered. Selection of methodology, therefore, was partially determined by access of the methodology on an existing computer system.

4. Pretesting and interpretation of results. Using input from twelve (12) MOS a preliminary clustering solution was produced. A review of the interpretation of the results was made, including input from the COR and representatives of the Air Force Human Resources Laboratory.

5. Based on the results of pretesting and interpretation, the following decisions were made:

   a. The Statistical Analysis System (SAS) methodology was selected for processing clustering results. For comparative purposes, input data are supplied to the National Capitol Region Soldier Support Center so results can be processed via CODAP.

   b. Both nominal and ratio expression of input data has merits. Therefore, percentage of frequency of occurrence of prerequisite competency statements is used in the primary clustering solution and nominal data (occurrence or nonoccurrence of prerequisite competency statement) are used for an alternate solution.

   c. While clustering results were successful in summarizing data and could be logically interpreted, they did not have practical application in developing curricula models. (A more thorough explanation of this decision is provided in the next section on curricula models.)

Clustering Reports. A single clustering report, in accordance with CDRL Sequence Number A006, has been produced. A description of the results is provided at Attachment F. In addition, the National Capitol Region Soldier Support Center has produced a clustering solution using CODAP methodology. Personnel at that agency should be directly contacted concerning CODAP results.

Curricula Model

Development of the curricula model proceeded on an intermittant basis during the timeframe of 15 December 1982 and 15 May 1983. "Straw reports" were developed, reviewed, and further development undertaken.

Curricula Model Activities. Major activities associated with development of the curricula model were as follows:

1. Formulation of major issues associated with model development. The following, in the form of questions, were stated as major issues:

   a. What is the potential program content that the curricula models should address?

   b. How could MOS clustering results be used?

   c. How should the remediation content be divided into curricula modules? What are the modules?

   d. How should the curricula modules be arranged into a "course map?" Instructional sequence?

   e. How should lessons be derived for modules?

f. Is more than one version of each module necessary to accommodate factors such as MOS context, level of difficulty of presenting stimuli, diversity of prerequisite competency statement?

g. How should (if at all) frequency counts for prerequisite competencies impact curricula?

h. If clustering results are used, what approaches can be taken to insure that each MOS has access to only the modules supported by analysis data? What is the consequence of having access to more than needed or less than needed?

i. If the same prerequisite competency has been identified for BSEP I and BSEP II, should there be differences in the curricula to accommodate this situation?

2. Assessment of use of clustering results as basis for model development. In accordance with the subject contract, MOS were to be clustered and the clustering results were to be the basis for developing the curricula model. In February 1983 it became clear that a curricula model based on clustering results would provide several areas of ambiguity and inefficiency. First, only indirect information was available to formulate and sequence modules. Second, information contained in other reports could be more directly used to determine and sequence modules and lessons. Third, there is a considerable redundancy of prerequisite competencies across clusters. And finally, there was concern that frequencies may have determined clustering solutions without regard for other more important factors.

3. Based on considerations noted above, the clustering report was not used as the basis for curricula model development. The following data sources were used as a basis for development:

   a. An MOS by prerequisite competency by BSEP level matrix. Nominal scaling -- occurrence or nonoccurrence of prerequisite competency -- was used on the matrix.

   b. Categories and subcategories identified on the elaborated taxonomy.

   c. Prerequisite competency indicator statements and extended analysis results.

Curricula Model Results. Results of the curricula model development effort are expressed in a comprehensive report which contains the following:

1. Rationale of approach.

2. A graphic presentation of a module configuration which is at Attachment G.

3. Module descriptions in terms of basic content, context, levels of difficulty, and functional designations.

4. Utilization of the model designations in terms of MOS Baseline Skills Profiles.

Curricula Model Report. The Curricula Model Report, CDRL Sequence Number A008, contains all information on the model as described above.

Design Specifications

Development of the curriculum design specifications proceeded on an intermittent basis during the timeframe of 15 November 1982 to 30 June 1983. "Straw reports" were developed, reviewed, and further development undertaken.

Design Specifications Activities. Major activities associated with development of the curriculum design specifications were as follows:

1. Defining the unit for which specifications were to be developed. Since the curricula model is expressed in terms of modules, the main unit for the specifications is the module. However, to provide specific guidance additional detail is required on a lesson level. Therefore, it was decided that specifications would be developed on a lesson-by-lesson basis.

2. Describing the structure of the design specifications. In order to convey information for curriculum development purposes each specification contains the following information:

   a. A narrative description of the module contents.

   b. A lesson structure (sequence).

   c. Recommendations as to the predominant MOS or CMF from which context clues can be gained.

   d. A narrative description of the lesson contents.

   e. Recommendations on primary and secondary instructional delivery approaches.

   f. Descriptions of instructional strategies (activities).

   g. Recommendations on sequence of instructional strategies.

Design Specifications Reports. The Design Specifications Report, CDRL Sequence Number A009, consists of specifications for the lessons for 122 modules. A list of the module titles is at Attachment H.

Conclusions and Recommendations

Listed below are major conclusions and recommendations resulting from the effort, but not contained in the separate reports noted above.

1. The following specific recommendations result from the IETCSS analysis effort:

   a. Study and listening skills appear to be related to success in IET. The Government should review existing commercially produced instructional materials in the areas of study and listening skills, procure materials most suited to their needs, place the materials in education centers, and conduct studies to verify whether success in IET is enhanced through utilization of materials.

   b. Enhanced quality control is needed with regard to instructional materials. The areas in which quality control should be exercised include: reduction in reading grade level (RGL) or at least adherence to RGL directives; improvements in the size and quality of materials presented graphically; inclusion of more practice exercises in written materials; selection of audio visual materials that are high in quality with regard to presentation.

   c. Each service school should conduct a study of potential barriers to learning--excessive heat, cold or noise and limited vision in training areas, etc. If such studies have been made, as has been indicated, then the time appears appropriate for action. Controlled studies comparing existing conditions with improved conditions should be designed, funded, authorized, and conducted.

2. The following specific conclusions and recommendations result from the task analysis effort:

   a. The ETAP are a viable approach to task analysis.

   b. The basic ETAP need to be augmented through analysis planning procedures. Analysis planning consists of the following: checking with training development personnel to ensure the appropriate task list or Soldier's Manual is being used; having SME and analyst personnel review all tasks and assemble, or at least locate and arrange for access to, all job aids, establish a specific time schedule for analysis activities--up to four (4) hours per day is recommended; group tasks for analysis according to common function and/or equipment and from simple to complex; if job aids have recently been introduced or revised have SME review them and check references to Soldier's Manual citations before each analysis session; and identifying the person or persons responsible for providing guidance to the SME and analyst.

   c. Mixed analysis procedures (factor and principle transfer) should proceed with a single SME and analyst. Once an initial write-up of analysis results has been obtained, a panel of 3-5 SME should review the write-up for technical accuracy and completeness. The original SME and analyst should be present at the panel sessions.

   d. The present project was able to identify prerequisite competencies and basic skills through utilization of the ETAP. Due to limitations in resources it was not able to adequately

determine if the competencies and skills were "taught" or "not taught" as part of the instructional process in IET. In order to make this determination the instructional review process needs to be extended to include review of POI and tests by analysts and SME and observation of training by analysts and SME. In addition, there must be an operational definition of the extent to which a competency or skill must be included in the instruction before it is considered to be "taught." One approach would be to require an objective and test for each competency or skill.

e. On the current effort is was extremely difficult to get SME to perform analysis for shared tasks, except at the proponent school. If this situation is indicative of the confidence senior NCO have in their ability to perform shared tasks, then perhaps an examination should be made as to whether most shared tasks are indeed critical tasks. If they are, the frequency with which shared tasks are included on the SQT should be increased.

3. The following specific recommendations result from the test development effort:

   a. Tests should be developed for the following taxonomy codes: 4c,15c,30c,38d,38e,38f,39b, 39c,41f,41g. Because these competencies were not conductive to a paper-based, multiple-choice format, subtests were not developed under the current effort. Tests for these competencies should be structured for administration in IET.

   b. Locator tests and subtests should be submitted to extensive validation studies. Modification P00006 to the subject contract describes anc initial effort. (See Phase III report).

   c. Cut scores should be established for the various subtests and MOS via the Angoff method. If this is not practicable, the cut scores should be set administratively based on resources available and the stated purposes and goals of current or planned remedial programs.

4. The curricula model and design specification efforts resulted in three (3) general conclusion and recommendations. First, an effort should be made to determine how and to what extent the model coincides with present BSEP instruction. Second, controlled studies are needed to determine if MOS context is a significant factor in determining instructional content, especially at the BSEP I level. And finally, pilot programs are recommended to determine the extent to which BSEP instruction can be made more functional--how BSEP instruction can interface in a more relevant way with technical training.

5. The current effort has resulted in several unique products for the U.S. Army: a defensible process that functionally ties prerequisite competencies to task requirements; an automated data bank for technical task analysis information for 94 MOS and common tasks; methodologies for producing valuable summary reports from the task analysis data. These products must now be maintained so they are current and accurate for future users. A top priority is to develop a comprehensive approach to data maintenance and update. A second priority is to examine the current results and methodologies to determine if an abbreviated methodology can be developed to apply to additional MOS.

ATTACHMENT A

Definition of Terms

1. Basic Skills Education Program I (BSEP I)- A designation which originates by classifying tasks. A BSEP I task is trained to mastery in IET.

2. Basic Skills Education Program II (BSEP II) - A designation which originates by classifying tasks. A BSEP II task is trained to mastery after the soldier has completed IET.

3. *Baseline* - A concept associated with an hierarchical arrangement of skills, procedures, or knowledges; a zone of demarcation; above the baseline skills, procedures, or knowledges are trained or instructed; below the baseline skills, procedures, or knowledges are assumed to be possessed because of previous training, education, or general experience.

4. Clustering - A statistical process by which MOS are grouped based on similarity of prerequisite competencies.

5. Course - A curricula organizational element that is subordinate to program and superordinate to module.

6. Curricula Model - A contract deliverable that shows and describes recommended curricula modules and an overall module configuration.

7. Curriculum Development - Those processes following analysis and design and preceding program operation. Includes original development work and adaptation and adoption of curriculum and program materials.

8. Design Specifications - A contract deliverable that describes the content-related instructional parameters for the designated modules and lessons.

9. *Discrepancies - Incongruities between stated doctrine or practice for task* performance and actual performance practices as reported by SME.

10. Extended Task Analysis Procedures (ETAP) - A comprehensive approach to task analysis with provisions for action and hierarchical analysis and knowledge analysis; provided as CFM on this effort and used with modifications.

11. Initial Entry Training (IET) - A collective term that applies to basic training (BT) and advanced individual training (AIT).

12. Initial Entry Training Course Survival Skills (IETCSS) - A contract deliverable which is a report on those skills required of and assumed to be possessed by a soldier for participation in and graduation from IET; derived from an analysis of the training environment and not from an analysis of job tasks.

13. Instructional Review - An integral step in the ETAP; the purpose of the process is to determine whether a skill, knowledge, or action is instructed or not instructed; requires the judgement of persons knowledgeable of instructional content of IET.

14. Knowledge Statement - A statement obtained from an SME in response to questioning concerning information related to task performance; may include entries from the taxonomy.

15. Lesson - A curricula organizational element that is subordinate to module and is composed of the instructional content associated with one or more prerequisite competencies.

16. Locator Test - A short test (30 items) from which raw scores are used to predict scores on subtests; established based on performance of students in pretest samples; bears only a general content relationship to particular subtests.

17. MOS Baseline Skills Profile - A contract deliverable that contains: prerequisite competencies, example prerequisite competency indicator statements, frequency of occurrence of prerequisite competencies, and descriptive summary information.

18. Module - A curricula organizational element that is subordinate to course and superordinate to lesson. It is composed of one or more lessons.

19. Prerequisite Competency - A statement taken from the taxonomy developed on the effort.

20. Prerequisite Competency Indicator Statement - A procedural (action) statement taken from task analysis results, that requires performance or utilization of a prerequisite competency.

21. Pretest - A preliminary collection of test items assembled for the purpose of pretesting as part of the test development process.

22. Program - The highest level curricula organizational element. There are two programs - - BSEP I and BSEP II.

23. Subtest - A short test (approximately ten (10) items) assembled after pretesting to relate to one or more prerequisite competencies.

24. Task - The statements contained in a Soldier's Manual (SM) or on a Task List (TL).

25. Task Analysis Results - A collection of completed data collection forms (usually three) that contain the results of enacting the ETAP for a particular task.

26. Taxonomy - A statement of skills developed on the effort. The skills are directly related to task performance and are based on excerpts from analyst's work related to skills and knowledges that underlie task performance.

27. Technical Prerequisite - A procedural (action) statement within task analysis results which is identified as not instructed as a result of enactment of the instructional review process.

28. TPA-1, TPA-2, TPA-3, TPA-X - Codes contained on the task analysis data collection forms; sometimes used as an abbreviated form of denoting what is in the results of task analysis.

29. Verification - A process integral to the ETAP in which a second SME reviews the write-up of results obtained from an interview/demonstration with a first SME.

ATTACHMENT B

Location/MOS In IETCSS Effort

Location		MOS Number and Title
Aberdeen Proving Ground	44E	Machinist
	45B	Small Arms Repairer
	63G	Fuel and Electrical Systems Repairer
	63W	Wheel Vehicle Repairer
Ft. Sam Houston	91B	Medical Specialist
Ft. Benning	11B	Infantryman
	11C	Indirect Fire Infantryman
	11H	Heavy Antiarmor Weapons Crewman
Ft. Eustis	61B	Watercraft Operator
	67U	Medium Helicopter Repairer
	67Y	Attack Helicopter Repairer
	68G	Aircraft Structural Repairer
Ft. Sill	13F	Fire Support Specialist
	15D	Lance Missile Crew Member
	31V	Tactical Communications Systems Operator/Mechanic
	82C	Field Artillery Surveyor
Ft. Gordon	05B	Radio Operator
	26L	Tactical Microwave Systems Repairer
	26Q	Tactical Satellite/Microwave Systems Operator
	72E	Telecommunications Center Operator
Ft. Benjamin Harrison	71D	Legal Clerk
	71Q	Journalist
	75B	Personnel Administration Specialist
Ft. Knox	19D	Cavalry Scout
	19E	M48 - M60A1/A3 Armor Crewman

ATTACHMENT C

Staffing Pattern for Analysts at Field Locations

Location (X = Operation)

Date	Aberdeen	Belvoir	Benning	Bliss	Devens	Eustis	Gordon	Harrison	Sam Houston	Huachuca	Knox	Lee	McClellan	Monmouth	Redstone Arsenal	Rucker	Sill	Leonard Wood	Total Number of Analyst
June 1981	X			X		X	X	X											11
July 1981	X			X		X	X	X				X					X		13
August 1981	X			X		X	X	X				X					X		14
September 1981	X			X		X	X	X			X	X					X		14
October 1981	X		X	X		X	X	X			X	X	X	X	X	X	X		24
November 1981	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X		28
December 1981	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X		28
January 1982	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	28
February 1982	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	28
March 1982	X	X	X	X	X	X	X	X	X		X	X	X		X		X	X	29
April 1982	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	32
May 1982	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	33
June 1982	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	33
July 1982	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	29
August 1982		X	X	X		X	X	X	X			X	X		X	X	X	X	24
September 1982		X	X			X	X	X	X			X	X		X				15
October 1982			X			X			X				X		X				14
November 1982						X			X										5
December 1982						X			X										3

ATTACHMENT D

Task Analysis Reports

Derivation of Task Analysis Reports

Analysis reports, all in response to CDRL Sequence Number A004, are characterized as analysis results (data) and summary reports. Figures 1 and 2, below, show the derivation of each report. Two (2) additional reports were produced. The first is an operational summary that describes major features of events associated with conducting the task analysis effort. The second is a matrix which provides prerequisite competency frequency and percentage of frequency of occurrence data on an MOS-by-MOS basis by BSEP level.

Listing and Description of Analysis Reports

The separate analysis reports and a brief description of each are as follows:

1. Analysis Data (Results) - A two- or three-part report, on a task-by-task basis. Contains descriptive information on the task, including discrepencies; the hierarchical arrangement of task analysis information; and prerequisite competency information.

2. Operational Summary - As noted above, describes major features of events associated with conducting the task analysis effort; presented mainly on an MOS-by-MOS basis.

3. Task Statement List - Presented on an MOS-by-MOS basis and as a complete listing. Shows shared tasks and common tasks.

4. Subtask Statement List - Presented as a listing of titles which shows the original task and all other tasks that use the subtask. Also, presented with all steps and substeps (complete subtask).

5. Discrepencies - Information on variance between doctrine and stated procedure and performance of procedure as reported by an SME.

6. Knowledge Statements - Statements obtained from SME in response to questions concerning information related to task performance; may include entries from the taxonomy.

7. Technical Prerequisites - A procedural (action) statement within task analysis results (data) which is identified as not instructed as a result of enactment of the instructional review process.

8. Prerequisite Competency Indicator Statements - Procedural (action) statements within task analysis results (data) and the attendant prerequisite competency statement code. Presented on both an MOS-by-MOS and complete basis.

9. Matrix - As noted above, provides prerequisite competency frequency and percentage of frequency of occurrence data on an MOS-by-MOS basis by BSEP level.

10. MOS Baseline Skills Profile - Presented on an MOS-by-MOS basis by BSEP level. Contains: prerequisite competencies, example prerequisite competency indicator statements, frequency of occurrence of prerequisite competencies, and descriptive summary information.

RCA/BSEP ANALYSIS CLUSTERING AND DESIGN INFORMATION FLOW FOR 24 MOS
TO BE DELIVERED USING THE ORIGINAL BSEP TAXONOMY

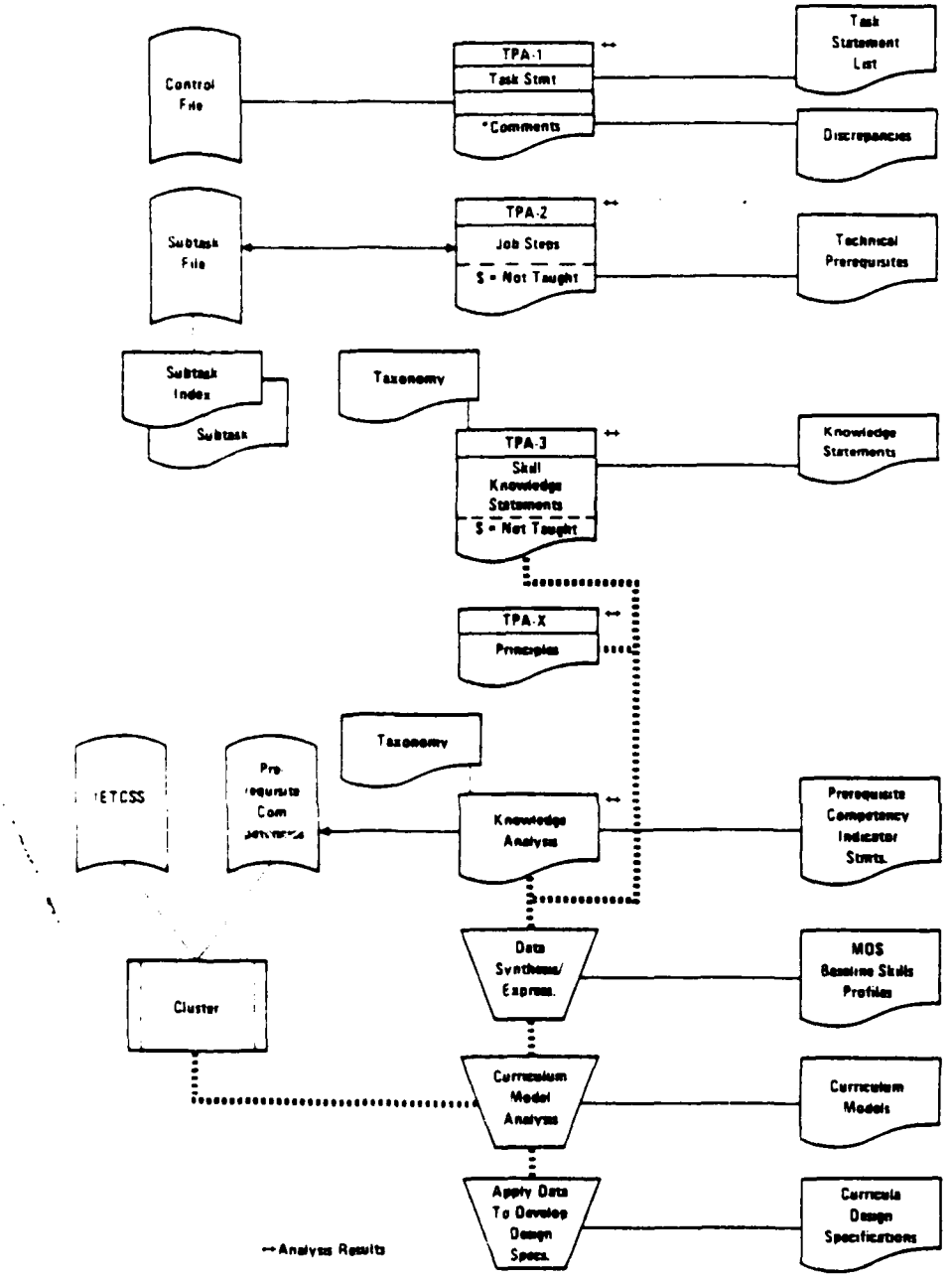

Figure 1.

RCA/BSEP ANALYSIS, CLUSTERING AND DESIGN INFORMATION FLOW FOR 72 MOS
TO BE DELIVERED USING THE ELABORATED BSEP TAXONOMY

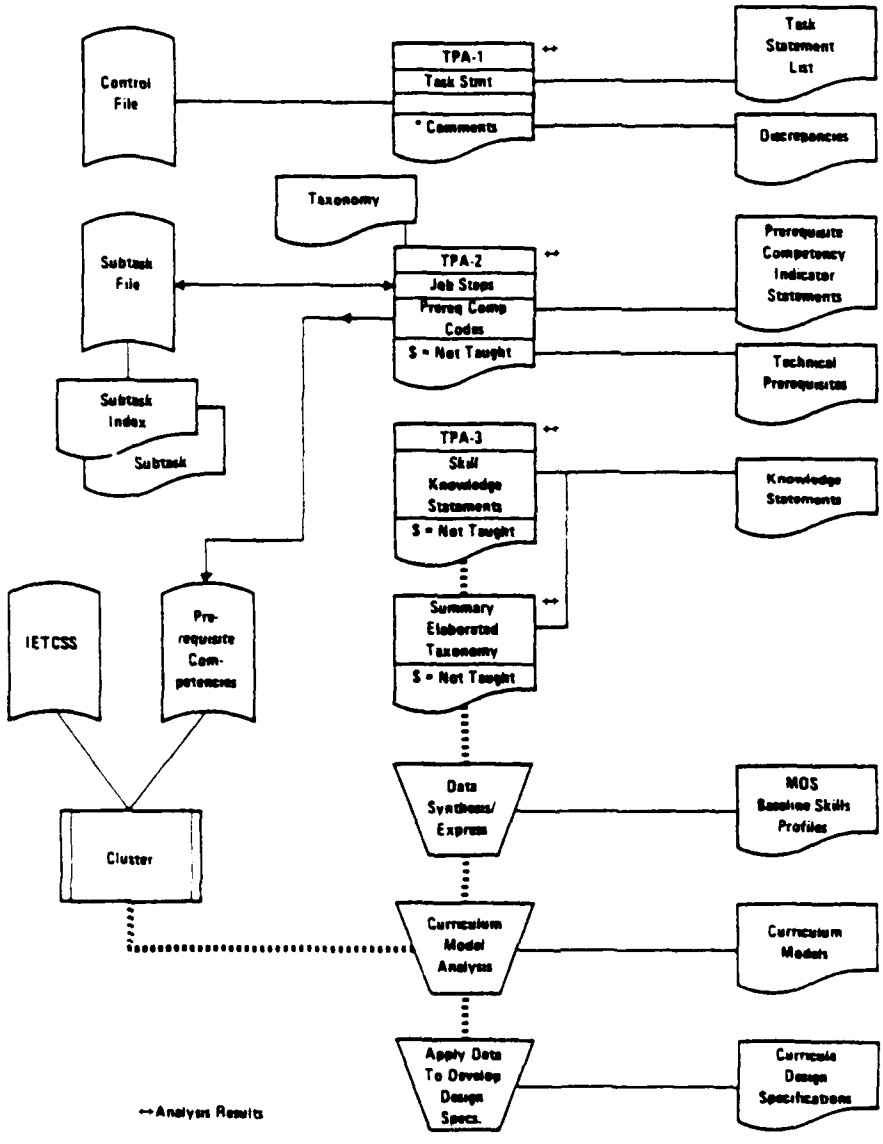

Figure 2.

Review/Approval of Analysis Results

Several processes were used to review analysis results and one process was used to approve results. Each is briefly described below.

1. As described previously, substantiation sessions (procedures) were used so the initial SME could check data recorded for technical accuracy and completeness. Those sessions were the first stage of a review process.

2. Verification sessions were the second stage in a review process. A second SME or group of SME reviewed analysis write-ups and recommended changes. Analysts resolved differences between SME.

3. All results of analyses were edited and reviewed prior to data entry. Structure, format, and conventions for coding were the main areas checked. Analysts were contacted via telephone to clarify or verify areas of substantive discrepancy.

4. After analysis results had been entered into the data system copies were printed and mailed to the service school for review and approval. Based on guidance provided by the COR, each service school formed groups or committees of key technical and educational personnel to review and approve the analysis reports. These reviews were concerned with technical accuracy and completeness and accuracy of coding for prerequisite competencies. Each group received written guidelines for the review process. The efforts of the review were recorded and supplied back to the contractor. Where practicable changes were incorporated in the analysis reports. If not practicable, comments were included as errata to the analysis reports. Since all summary reports (as shown in figures 1 & 2) are derived from the analysis reports, changes recommended by the service school review groups are reflected in these reports. Also, since profiles, curricula models, clustering, and curricula design specifications were finalized subsequent to review and approval of analysis reports, changes recommended are reflected in these products.

Usability of Analysis Reports Within the Project

Various analysis reports shown in figures 1 & 2 contributed to the development of other project products and reports. The main areas of contribution are as follows:

1. Codes and frequency counts for prerequisite competencies were the main inputs to the clustering solutions.

2. MOS Baseline Skill Profiles were prepared as follows:

   a. Codes and frequency counts for prerequisite competencies were derived from analysis reports.

   b. For each MOS, prerequisite competency indicator statement lists were reviewed. Based on this review a statement was selected for inclusion on the profile. The main factors considered in the review were thoroughness of coverage of the competency and representativeness of the indicator statement for the MOS.

c. Based on frequency counts the summary portions of the profiles were developed.

3. Profiles, prerequisite competency indicator statement lists, and the matrix were used to provide input to the development of the curricula models.

4. Prerequisite competency indicator statement lists and the matrix were the most useful in developing the curricula design specifications.

Potential Usability of Analysis Reports

Perceptions of the potential (future) usability of analysis reports are as follows:

1. Analysis data (results) should be directly usable in the 94 MOS for any future training development activity.

2. Efforts related to shared task management can use the Complete Task Statement List and the Subtask Statement List as resource documents.

3. The Discrepancies List can be viewed as a summary of the major areas of variance resulting from the verification process. It can serve as one tool toward an action survey of current training practices.

4. One major goal of the project was design of remedial training programs based on prerequisite competency deficiencies. MOS Baseline Skills Profile, lists of prerequisite competency indicator statements, and the matrix should provide a rich source of input and job specific foundation for any future program and curriculum development effort.

ATTACHMENT E

Test Title Listing

Prerequisite Competency Code	Prerequisite Competency Statement	Test Code	Test Title
1a	Match numerals with word names and models	NU1	Numerical: Matching Numbers with Word Names and Models
1b	Write numerals one through N in sequential order from any starting point	NU4	Numerical: Counting and Sequence of Numbers
1c	State what numeral comes after, before, or between any two given numerals	NU5	Numerical: Ordering Numbers
1d	Select the numeral which is greater/lesser from a set of numerals	NU5	Numerical: Ordering Numbers
1e	Identify an object with a specified ordinal position	NU3	Numerical: Ordinal Use of Numbers
1f	Write or state the place value of a particular digit, whole, or decimal number	NU2	Numerical Place Value
1g	Round off a number to a specified place, whole or decimal	NU12	Numerical: Rounding Numbers
1h	Count by ones, twos, fives, tens, etc. backward or forward (skip counting)	NU4	Numerical: Counting and Sequence of Numbers
1i	Match numbers with points or intervals on a number line (positive (+) or negative (-) values	NU6	Numerical: Points and Intervals on a Number Line
2a	Name the markings on a linear scale	ME13	Measurement: Number of Parts on a Linear Scale
		ME14	Measurement: Markings on a Linear Scale
2b	Differentiate units of measure and equivalents in the English and metric system	ME11	Measurement: Conversion of Measures
2c	Use of ruler, yardstick, meter stick or scale to measure lengths of objects or distances	ME13	Measurement: Number of Parts on a Linear Scale
		ME17	Measurement: Reading a Ruler
2d	Identify measures of ounce, pound, gram	ME1	Measurement: Common Units of Measure
2e	Identify measures of pints, quarts, gallons, liters	ME1	Measurement: Common Units of Measure
2f	Use a scale which is not numerically calibrated	ME6	Measurement: Estimation of Linear Measures Not More Than 6 Inches
		ME16	Measurement: Reading a Scale That is Not Numerically Calibrated
2g	Estimate measures of varying lengths, dimensions, or weight	ME7	Measurement: Estimation of Linear Measures
		ME8	Measurement: Visual Comparisons of Measures
3a	Identify degree or mil as a unit in determing direction, distance, or temperature	ME4	Measurement: Angles
		SP10	Spatial: Visual Comparison of Sizes of Geometric Figures
3c	Interpret bearings, azimuth or other contexts in which the measure of an angle may range from 0 to 360 degrees/0 to 6400 mils	ME5	Measurement: Bearings and Azimuths
4a	Use a 24-hour or digital clock to tell time	ME2	Measurement: Telling Time
4b	Name intervals and tell time in hours, minutes, and seconds	ME2	Measurement: Telling Time
4c	Estimate time in seconds, minutes and parts of an hour	(No test developed)	
4d	Identify calendar units and arrange them in Julian style	ME3	Measurement: Use of Julian Calendar
4e	Convert time into hours and tenths of hours	CO14	Computation: Computation Using Measures
		ME9	Measurement: Solving Measurement Problems
4f	Compute time using Greenwich Mean Time (GMT) as a basis for establishing zones and distances	CO14	Computation: Computation Using Measures
		ME9	Measurement: Solving Measurement Problems
5a	Identify the unit of measurement found on an instrument	ME13	Measurement: Number of Parts of a Linear Scale
		ME14	Measurement: Markings on a Linear Scale
		ME19	Measurement: Reading Simple Gauges
5b	Interpret the number, word, symbol from a display read-out	ME16	Measurement: Reading a Scale That is Not Numerically Calibrated
		ME21	Measurement: Reading an Oscilloscope
5c	Recognize a "reading" from a gauge with color divisions	ME16	Measurement: Reading a Scale That is Not Numerically Calibrated
5d	Recognize positive (+) and negative (-) demarcation on a scale	ME13	Measurement: Number of Parts of a Linear Scale
		ME14	Measurement: Markings on a Linear Scale
5e	Select band(s) from a multi-scale gauge	ME13	Measurement: Number of Parts of a Linear Scale
		ME14	Measurement: Markings on a Linear Scale
5f	Match a gauge reading to a specification using numbered or labeled intervals	ME13	Measurement: Number of Parts of a Linear Scale
		ME14	Measurement: Markings on a Linear Scale
		ME20	Measurement: Reading Vernier, Micrometer, and Related Scales
		ME22	Measurement: Reading a Logarithmic Scale

Prerequisite Competency Code	Prerequisite Competency Statement	Test Code	Test Title
4a	Interpret gauge readings from an unnumbered, unmarked interval	ME13	Measurement: Number of Parts of a Linear Scale
		ME15	Measurement: Estimating Readings on a Scale
4b	Interpret a gauge reading which is fluctuating or momentarily sustained	ME13	Measurement: Number of Parts of a Linear Scale
		ME15	Measurement: Estimating Readings on a Scale
5a	Match specifications of required measures by manipulation, alignment or maintenance	ME13	Measurement: Number of Parts of a Linear Scale
		ME18	Measurement: Reading Ammeters, Voltmeters, and Related Scales
6a	Identify directions that tools, hardware, or components may be moved	SP1	Spatial: Orientation in Space
6b	Manipulate objects to align, match, mate, make parallel, be perpendicular or be at an angle	SP11	Spatial: Matching and Alignment of Figures
6c	Interpret spatial relationships of figures and objects from 2-dimensional drawings, pictures, or photographs	SP2	Spatial: Rotation and Reflection
		SP6	Spatial: Interpretation of Three-Dimensional Models
6d	Relate geometric symbols and graphic representations to actual systems, subsystems, and components	SP5	Spatial: Schematic Diagrams
7a	Identify and name points, lines, rays, and segments	SP8	Spatial: Common Geometric Figures and Their Properties
7b	Identify intersecting lines, parallel lines, and line segments	SP3	Spatial: Parallel and Perpendicular Lines and Planes
7c	Define and identify perpendicular lines	SP3	Spatial: Parallel and Perpendicular Lines and Planes
7d	Identify congruent segments	SP4	Spatial: Comparison of Shapes and Sizes of Geometric Figures
8a	Identify and name plane geometric figures	SP8	Spatial: Common Geometric Figures and Their Properties
8b	List the characteristics of geometric figures	SP8	Spatial: Common Geometric Figures and Their Properties
8c	Classify figures according to the number or measures of its sides or angles	SP8	Spatial: Common Geometric Figures and Their Properties
8d	Identify figures which possess similarities	SP4	Spatial: Comparison of Shapes and Sizes of Geometric Figures
8e	Identify figures which may be parallel, perpendicular, or congruent	SP3	Spatial: Parallel and Perpendicular Lines and Planes
9a	Identify and name the different kinds of angles and triangles, with their corresponding figures	SP8	Spatial: Common Geometric Figures and Their Properties
9b	Identify vertical, adjacent, complementary, or supplementary angles	SP9	Spatial: Meaning of Technical Terms
9c	Classify triangles according to their sides or angle-size	SP8	Spatial: Common Geometric Figures and Their Properties
9d	Identify altitudes and medians of triangles or the bisector of an angle	SP9	Spatial: Meaning of Technical Terms
9e	Name an angle by using letters, a number, or a single letter	ME4	Measurement: Angles
10a	Recognize and match the names of solids with their corresponding figures	SP8	Spatial: Common Geometric Figures and Their Properties
11a	Identify technical words associated with geometric figures	SP9	Spatial: Meaning of Technical Terms
11b	Interpret meaning of terms derived from spatial orientation	SP7	Spatial: Meaning of Spatial Terms
12a	Add or subtract whole numbers, without carrying or borrowing	CO1	Computation: Addition and Subtraction of Whole Numbers
		CO11	Computation: Approximate Numbers
12b	Add or subtract whole numbers, carrying and borrowing	CO1	Computation: Addition and Subtraction of Whole Numbers
		CO11	Computation: Approximate Numbers
12c	Add and subtract, borrowing and carrying with mixed numbers (whole and decimals)	CO5	Computation: Addition and Subtraction of Decimals
		CO11	Computation: Approximate Numbers
12d	Add or subtract positive (+) and negative (-) numbers, using a number line to arrive at a solution	CO7	Computation: Addition and Subtraction of Integers
12e	Add or subtract to find correct time (24 hour clock) using hours or minutes	CO14	Computation: Computation Using Measures
		ME9	Measurement: Solving Measurement Problems
12f	Add or subtract various increments on gauges, dials, or other measuring instrument	CO14	Computation: Computation Using Measures
		ME9	Measurement: Solving Measurement Problems
12g	Add or subtract time, linear, dry, liquid or degree measures requiring regrouping	CO14	Computation: Computation Using Measures
		ME9	Measurement: Solving Measurement Problems
12h	Estimate a sum or difference	CO12	Computation: Estimation

Prerequisite Competency Code	Prerequisite Competency Statement	Test Code	Test Title
13a	Multiply and divide whole numbers	CO2	Computation: Multiplication and Division of Whole Numbers
13b	Multiply and divide mixed numbers (whole and decimal)	CO6	Computation: Multiplication and Division of Decimals
13c	Divide a number with decimals in both divisor and dividend	CO6	Computation: Multiplication and Division of Decimals
13d	Multiply and divide integers, both positive (+) and negative (-), and assign proper sign to product or quotient	CO8	Computation: Multiplication and Division of Integers
13e	Estimate a product or quotient	CO12	Computation: Estimation
14a	Subdivide whole objects or sets of objects into halves (1/2), thirds (1/3), fourths (1/4), eighths (1/8)	NU1	Numerical: Matching Numbers with Word Names and Models
14b	Reduce fractions to lowest terms	NU7	Numerical: Equivalent Fractions
14c	Convert fractions (proper and improper) to decimal equivalents, and vice versa, using a table, chart, or gauge	NU8	Numerical: Equivalence Among Fractions, Decimals, Percents, Mixed Numbers
14d	Compute equivalent value of fractions, decimals, percents, and mixed numbers to lowest terms	NU8	Numerical: Equivalence Among Fractions, Decimals, Percents, Mixed Numbers
14e	Add and subtract fractions, with same or different denominators	CO3	Computation: Addition and Subtraction of Fractions
14f	Multiply and divide fractions with and without whole numbers	CO11	Computation: Approximate Numbers
		CO4	Computation: Multiplication and Division of Fractions
14g	Estimate a fractional sum, product, or quotient	CO11	Computation: Approximate Numbers
15a	Draw geometric figures, plane and solid	CO12	Computation: Estimation
15b	Match geometric figures with word names, equivalent measures	SP8	Spatial: Common Geometric Figures and Their Properties
15c	Label all parts of geometric figures using mathematical and characteristic designators	SP8	Spatial: Common Geometric Figures and Their Properties
15d	Use a protractor to measure angles, make geometric constructions	(No test developed)	
15e	Construct perpendicular on a line segment, bisector of an angle	ME4	Measurement: Angles
15f	Compute the perimeter and area of any figure	SP3	Spatial: Parallel and Perpendicular Lines and Planes
		ME10	Measurement: Perimeter, Area, and Volume
15g	Compute the circumference and area of a circle	SP10	Spatial: Visual comparison of sizes of Geometric Figures
15h	Compute the area and volume of any solid figure	ME12	Measurement: Circumference and Area of Circles
		ME10	Measurement: Perimeter, Area, and Volume
15i	Use formulas in solving problems involving geometric figures	SP10	Spatial: Visual comparison of Sizes of Geometric Figures
		ME10	Measurement: Perimeter, Area, and Volume
15j	Solve problems and interpret spatial relationships of figures, symbols and objects from 2-dimensional displays	SP10	Spatial: Visual Comparison of Sizes of Geometric Figures
		SP2	Spatial: Rotation and Reflection
15k	Identify median and mode	SP6	Spatial: Interpretation of Three-Dimensional Models
16l	Compute averages	CO15	Computation: Median and Mode
16a	Solve problems combing all processes using whole, mixed numbers and fractions	CO10	Computation: Averages (arithmetic Mean)
16b	Solve problems, combing all processes, involving units of measurement	CO9	Computation: Combinations of Operations
		CO14	Computation: Computation Using Measures
16c	Interpret information from charts, numberlines, scales and graphs to solve arithmetic problems	ME9	Measurement: Solving Measurement Problems
		CO14	Computation: Computation Using Measures
16d	Solve conversion problems of linear, metric and (english) liquid, weight, and temperature (F degree or C degree) measure	ME9	Measurement: Solving Measurement Problems
16e	Solving problems involving ratio and proportion	CO14	Computation: Computation Using Measures
16f	Solve word problems where any mathematical process may occur	ME9	Measurement: Solving Measurement Problems
		NU9	Numerical: Ratio and Proportion
		CO14	Computation: Computation Using Measures
		ME9	Measurement: Solving Measurement Problems

Prerequisite Competency Code	Prerequisite Competency Statement	Test Code	Test Title
17a	Identify coordinates of a point in any grid system	GR1	Graphing: Coordinates of a Point in a Grid System
17b	Identify points on a line graph	GR2	Graphing: Points on a Line Graph
17c	Match a graph with its equation	GR3	Graphing: Matching a Graph with its Equation
18a	Solve simple algebraic equations with one unknown	CO13	Computation: Evaluation of Formulas
18b	Recognize and derive equivalent algebraic expressions	AL1	Algebra: Equivalent Algebraic Expressions
18c	Evaluate powers and estimate roots	AL2	Algebra: Evaluation and Estimation of Powers and Roots
		NU10	Numerical: Exponents
19a	Use tables of trigometric functions	TR2	Trigonometry: Use Tables of Trigometric Functions
19b	Use tables of logarithms to solve problems	TR4	Trigonometry: Use of Logarithmic Tables
		NU10	Numerical: Exponents
		NU11	Numerical: Scientific Notation
19c	Solve geometric problems using trigometric functions	TR1	Trigonometry: Basic Trigometric Ratios
19d	Use trigometric ratios to solve problems	TR3	Trigonometry: Problems Using Trigometric Ratios
25a	Identify factual details or specification that are found within a statement or written selection	PD1	Procedural Directions or Prose: Factual Details
25b	Select parts of a text and visual materials to complete a task activity	PD2	Procedural Directions or Prose: Relevant and Irrelevant Information
25c	Follow highly - detailed, step-by-step directions in order to accomplish a sequence of task activities	PD3	Procedural Directions or Prose: Sequence and Detail
25d	Determine the essential message of a paragraph or section of written material	PD4	Procedural Directions or Prose: Essential Message
25e	Infer from a written source, which does not explicitly provide required information, in order to make a decision	PD5	Procedural Directions or Prose: Inferences
25f	Synthesize information from written sources which contributes to the completion of a task activity	PD6	Procedural Directions or Prose: Information from Multiple Sources
26a	Recognize common words and their meanings	VO1	Vocabulary: Common Words
26b	Recognize task-related words with technical meanings	VO2	Vocabulary: Technical Words
26c	Identify the correct meaning of a word from the context of a sentence	VO3	Vocabulary: Words in Context
26d	Recognize the meaning of common contractions, abbreviations, and acronyms	VO4	Vocabulary: Contractions and Abbreviations
26e	Determine the meaning of figurative, idiomatic, and technical terms by using context clues or by using a reference source(s)	VO5	Vocabulary: Figurative, Idiomatic, and Technical Terms in Context
27a	Locate a Technical Manual, Field Manual or any related source document by code number and title	RS1	Reference Skills: Code Number and Title of Source Documents
27b	Alphabetize words or topics to locate information	RS2	Reference Skills: Alphabetical Order
27c	Use the table of contents, index, system or subsystem heading, appendix and glossary to locate information	RS3	Reference Skills: Table of Contents and Index
27d	Locate the page, title, paragraph, figure, or chart needed to answer a question or to solve a problem	RS3	Reference Skills: Table of Contents and Index
27e	Determine, after scanning or skim-reading, whether the information is relevant	PD2	Procedural Directions or Prose: Relevant and Irrelevant Information
27f	Cross-reference within and across source documents to select information needed to perform a routine	PD6	Procedural Directions or Prose: Information from Multiple Sources
27g	Organize information from multiple sources into a sequenced series of events	PD6	Procedural Directions or Prose: Information from Multiple Sources
28a	Obtain a factor specification from a two-column table or chart to find information	TC1	Tables/Charts: Two-Column Charts
28b	Obtain a factor specification from an intersection of a row by column table or chart	TC2	Tables/Charts: Three or More Column Charts
28c	Use a complex table or chart requiring cross-referencing within or in combination with text material outside the chart	TC3	Tables/Charts: Cross Referencing

Prerequisite Competency Code	Prerequisite Competency Statement	Test Code	Test Title
28d	Apply information from tables and charts for locating malfunctions, or for selecting a course of action	TC4	Tables/Charts: Troubleshooting
29a	Identify details, labels, numbers, and parts from an illustration or picture	IL1	Illustrations or Diagrams: Pictorial Details
29b	Identify parts or details according to a key or legend	IL2	Illustrations or Diagrams: Keys and legends
29c	Interpret a drawing which shows a cross-sectional view of an object for assembly, disassembly	IL1	Illustrations or Diagrams: Pictorial Details
29d	Interpret a three dimensional projection or exploded view of object(s) for assembly, disassembly, or position in system or subsystem	IL1	Illustrations or Diagrams: Pictorial Details
29e	Follow illustrations, or photographs, arranged in sequential order, as a guide	IL3	Illustrations or Diagrams: Sequence
29f	Integrate information from various sources to select a course of action	PD6	Procedural Directions or Prose: Information From Multiple Sources
30a	Use a simple linear path of an organizational chart to list events in sequential order	FC1	Flow Charts: Organization Charts
30b	Use a linear path of a flow chart to provide visual and textual directions to a procedure, to arrive at decision points, and to provide alternate paths in problem solving	FC2	Flow Charts: Linear Paths
30c	Translate the significance of the symbols into physical activities	(No test developed)	
31a	Isolate each major section or entity presented in a schematic diagram	SC1	Schematics: Schematic Diagrams
31b	Identify the components within each entity	SC1	Schematics: Schematic Diagrams
31c	Trace connections in an integrated circuit from their origin to another point within or from one entity to another	SC1	Schematics: Schematic Diagrams
31d	Isolate a problem component in a schematic and trace it to components believed to cause the problem	SC1	Schematics: Schematic Diagrams
31e	Interpret symbols to indicate direction of flow, test points, components and diagrammatic decision points	SC1	Schematics: Schematic Diagrams
32a	Locate a block on a form to enter the appropriate information	FO1	Forms: Entering Information
32b	Transfer a number, code, date, figure or related data from equipment or written sources onto an appropriate section of the form	FO1	Forms: Entering Information
32c	Write the name of the organization, responsible personnel, disposition of the part or equipment, and nomenclature, in appropriate sections of the form	FO1	Forms: Entering Information
32d	Write a descriptive account of an activity or transaction performed	FO2	Forms: Accuracy of Statements
32e	Use a completed form to locate or compare information	FO3	Forms: Locating Information
33a	Distinguish between essential and nonessential details during the note-taking process	NT1	Note-Taking: Essential Details
33b	Record details without misinterpreting the intent of either written material or an interview	NT2	Note-Taking: Accuracy
33c	Rewrite all recorded details in sentence form	ED8	Editing: Complete Sentences
33d	Organize all sentences into paragraphs	ED6	Editing: Paragraph Organization
34a	Distinguish between major and subordinate topics	OU1	Outlining: Organization
34b	Generate titles for each major topic selected	OU1	Outlining: Organization
34c	Use phrases or sentences to provide subordinate details under each major topic	OU1	Outlining: Organization
34d	Alternate, indent numbers and letters to establish a hierarchy	OU2	Outlining: Format
35a	State the intent or objective(s) of the report	RW1	Report Writing: Intent
35b	Describe the parameters of the event or situation	RW2	Report Writing: Description of Events
35c	Distinguish between relevant and irrelevant details	PD2	Procedural Directions or Prose: Relevant and Irrelevant Information
35d	Sequence events in the order they have occurred	RW3	Report Writing: Sequence of Events

Prerequisite Competency Code	Prerequisite Competency Statement	Test Code	Test Title
35e	State general impressions of events described	RW4	Report Writing: Impression of Events
35f	Select examples that will clarify major issues presented in the report	RW5	Report Writing Clarification of Issues
35g	Examine opposing points of view in the report	RW6	Report Writing: Supporting and Opposing Evidence
35h	Summarize the major points developed in the report	RW7	Report Writing: Accuracy of Summaries
35i	Justify an action taken and give reasons for rejecting alternatives	RW8	Report Writing: Jusification for Actions
36a	Spell frequently used words correctly	ED1	Editing: Spelling of Common Words
36b	Spell task-related words correctly	ED2	Editing: Spelling of Task-Related Words
36c	Identify words that need to be capitalized	ED3	Editing: Capitalization
36d	Correct all misspelled words with or without the use of a reference source	ED1	Editing: Spelling of Common Words
36e	Apply all rules of end marks, commas, and apostrophes		
36f	Apply common rules of grammar	ED5	Editing: Mechanics of Grammer
36g	Rewrite the paragraph by stating the main idea in the first sentence, and restructuring the sentences for coherence	ED6	Editing: Paragraph Organization
36h	Appraise an entire written communication and make adjustments to improve clarity	ED7	Editing: Clarity
38a	Enunciate clearly, using the proper rate of speech	(No test developed)	
38b	Use technical vocabulary suitable to the task and level of the person	VC1	Verbal Communication: Appropriate Language
38c	Determine the appropriate amount of information to communicate	VC1	Verbal Communication: Appropriate Language
38d	Interpret figurative or idiomatic language by reference to its use in context	(No test developed)	
38e	Follow highly detailed, step-by-step directions	(No test developed)	
38f	Solicit feedback to confirm the accurate reception of the communication	(No test developed)	
38g	Recognize when low-key, informal dialogue is suitable	VC2	Verbal Communication: Appropriate Type of Communication
38h	Recognize when direct verbal commands are necessary	VC2	Verbal Communication: Appropriate Type of Communication
38i	Recognize when a prescribed series of verbal interactions is required to coordinate a group effort	VC2	Verbal Communication: Appropriate Type of Communication
38j	Recognize when the situation will require a structured, preplanned method of presentation	VC2	Verbal Communication. Appropriate Type of Communication
39a	Recognize the need for clear, concise directions in order to avoid language or word meaning differences	VC3	Verbal Communication: Clarity of Directions
39b	Recognize personality factors and interpersonal relationships that may exist	(No test developed)	
39c	Recognize feedback as a means of communicating more effectively and increasing task competence	(No test developed)	
40a	Use common knowledge to avoid hazards in order to prevent injury to self or equipment	(No test developed)	
40b	Apply preventive measures prior to task performance to minimize any potential safety or security problem	PR1	Precautions: Safety Hazards
40c	Select an appropriate course of action in the event of an emergency	PR1	Precautions: Safety Hazards
41a	Identify similarities and differences between and among objects	PR2	Precautions: Emergency Actions
41b	Use body language (motions, gestures, postures) to communicate or signal	RE1	Recognition: Similarities of Objects
41c	Determine the presence of a defect or extent of damage	RE2	Recognition: Recognizing Motions and Gestures
41d	Match objects by size, shape, color or significant markings	RE3	Recognition: Damage and Defects
41e	Classify objects by size shape, color or significant markings	RE4	Recognition: Matching Objects
41f	Determine direction, duration, and intensity of sounds, sightings, and smells	RE5	Recognition: Classifying Objects
41g	Infer from sights, sounds, touch, smells	(No test developed)	
41h	Interpret codes and symbols	(No test developed)	
		IL4	Illustrations or Diagrams: Symbols

ATTACHMENT F

Clustering Results

Approach

Input to the SAS CLUSTER procedure was MOS as observations or cases, with their associated prerequisite competency codes as the attributes or variables. Together, the data for each MOS are called a "profile." The profiles were presented to the SAS CLUSTER procedure both as ratio -- percentage of frequency of occurrence -- and nominal -- occurrence or non-occurrence -- data. For each MOS, the occurrence of each prerequisite competency (PC) code was counted. The count of each PC code in an MOS was divided by the count of all PC codes in the MOS to arrive at the percentage of frequency of occurrence of each PC code. An MOS and its percentages were the ratio input to the SAS CLUSTER procedure. Percentages were changed to ones to be nominal input to the procedure.

Basically what the SAS CLUSTER procedure does is to compare each MOS profile with each other MOS profile by calculating the sum of the squared differences between each prerequisite competency code for each pair of MOS. The sum of the squared differences is called a distance. When each MOS constitutes a cluster, there is no difference in attributes, and the distance is zero. When clusters (MOS and groups of MOS) are compared, the distances are close to zero when the clusters are similar, and increasingly greater than zero as the clusters become less similar. The first clustering is of the two MOS that are most similar in terms of distance. Clustering continues until all MOS are in one cluster.

Handling/Describing Results

The SAS CLUSTER procedure produces two (2) reports; Cluster Analysis and Cluster Map. From these reports the user must decide the number of clusters that best represents the data processed. One reliable guide is to select the number of clusters that occurs when there is a sharp increase in distance measures. Using this guideline, 14 clusters best represented BSEP I ratio data and 13 clusters best represented BSEP II ratio data. (Nominal data results are discussed in the separate Clusterina Report.)

Once the number of clusters were chosen, it became necessary to examine the data to determine the extent to which the results accorded with the following guideline: Each cluster should contain MOS that are similar to each other based on the identified prerequisite competencies, and each cluster should be different from each other cluster. The following methodology was used to examine the results for BSEP I:

1. Inspect the input for values that will affect the results. Because the raw input data consisted of up to 201 variables per MOS (percentage of frequency of occurrence of each prerequisite competency), a decision was made to collapse the input data by combining the frequency of PC subcategories into major categories for each MOS. This resulted in 48 categories.

2. Develop a "profile" for each cluster. The profile consisted of the arithmetic mean for each category for each MOS. The number of categories, based primarily on frequency, was further reduced to 21. These 21 categories were referred to as indicant prerequisite competencies, i.e., they were significant in contributing to the descriptions of the clusters. The indicant prerequisite competencies were as follows:

Code	Indicant Prerequisite Competency
1	Numbering and counting
2	Linear, weight, and volume measures
5	Gauge measures
6a	Identify direction that tools, hardware, or components may be moved
6b	Manipulate objects to align, match, mate, make parallel or be at an angle
11	Terminology
12	Addition and subtraction
25	Procedural directions
26	Vocabulary
27	Reference skills
28	Tables/charts
29	Illustrations
32	Forms
37	Type (of verbal communication)
40a	Use common knowledge to avoid hazards in order to prevent injury to self or equipment
40b	Apply preventive measures prior to task performance to minimize any potential safety or security problem
41a	Identify similarities and differences between and amont objects
41d	Match objects by size, shape, color and significant markings
41e	Classify objects by size, shape, color and significant markings
41f	Determine direction, duration, and intensity of sounds, sightings and smells
41g	Infer from sights, sounds, touch, smells, or tastes to determine a course of action

3. Analyze and describe the cluster "profiles." The analysis and description was accomplished in terms of the occurrence, non-occurrence, and predominance of indicant prerequisite competencies.

Results for BSEP I

The results of the clustering of ratio input data for BSEP I are provided below. Detailed descriptions are provided in the separate Clustering Report.

Cluster Number 1 (26 MOS)

000	Common Soldier's Tasks
05G	Signal Security Specialist
11B	Infantryman
11C	Indirect Fire Infantryman
11H	Heavy Antiarmor Weapons Crewman
11M	Fighting Vehicle Infantryman

Cluster Number 1 (continued)

13B	*Cannon Crewman*
15E	Pershing Missile Crew Member
19D	Cavalry Scout
19E	M48 - M60A1/A3 Armor Crewman
27E	TOW/DRAGON Repairer
32H	Fixed Station Radio Repairer
54E	Chemical Operations Specialist
55D	Explosive Ordnance Disposal Specialist
57H	Terminal Operations Coordinator
63N	M60A1/A3 Tank System Mechanic
67G	Airplane Repairer
68F	Aircraft Electrician
68H	Aircraft Pneudraulics Repairer
68J	Aircraft Fire Control Repairer
68M	Aircraft Weapon Systems Repairer
74D	Computer/Machine Operator
91B	Medical Specialist
93J	ATC Radar Controller
95B	Military Police
95C	Correctional Specialist

Cluster Number 2 (5 MOS)

17B	Field Artillery Radar Crew Member
31J	Teletypewriter Repairer
31V	Tactical Communications Systems Operator/Mechanic
61B	Watercraft Operator
61C	Watercraft Engineer

Cluster Number 3 (2 MOS)

31N	Tactical Circuit Controller
35K	Avionic Mechanic

Cluster Number 4 (13 MOS)

05B	Radio Operator
05C	*Radio Teletype Operator*
26L	Tactical Microwave Systems Repairer
26Q	Tactical Satellite/Microwave Systems Operator
31M	Multichannel Communications Equipment Operator
44B	Metal Worker
44E	Machinist
63H	Track Vehicle Repairer
63W	Wheel Vehicle Repairer

Cluster Number 4 (continued)

67U Medium Helicopter Repairer
68G Aircraft Structural Repairer
71L Administrative Specialist
96B Intelligence Analyst

Cluster Number 5 (7 MOS)

13E Cannon Fire Direction Specialist
13F Fire Support Specialist
17C Field Artillery Target Acquisition Specialist
32D Station Technical Controller
55B Ammunition Specialist
74F Programmer/Analyst
82C Field Artillery Surveyor

Cluster Number 6 (2 MOS)

43M Fabric Repair Specialist
57E Laundry and Bath Specialist

Cluster Number 7 (3 MOS)

71D Legal Clerk
71Q Journalist
75B Personnel Administration Specialist

Cluster Number 8 (1 MOS)

76X Subsistence Supply Specialist

Cluster Number 9 (3 MOS)

12B Combat Engineer
43E Parachute Rigger
62E Heavy Construction Equipment Operator

Cluster Number 10 (19 MOS)

15D Lance Missile Crew Member
16E HAWK Fire Control Crew Member
16H ADA Operations and Intelligence Assistance
17K Ground Surveillance Radar Crewman
24C Inproved HAWK Firing Section Mechanic
24H Improved HAWK Fire Control Repairer
33S EWI Intercept Equipment Repairer
36C Wire Systems Installer I Operator

Cluster Number 10 (continued)

36K	Tactical Wire Operations Specialist
52C	Utilities Equipment Repairer
62B	Construction Equipment Repairer
63G	Fuel and Electrical Systems Repairer
64C	Motor Transport Operator
67N	Utility Helicopter Repairer
67T	Tactical Transport Helicopter Repairer
67V	Observation/Scout Helicopter Repairer
67Y	Attack Helicopter Repairer
68B	Aircraft Powerplant Repairer
68D	Aircraft Powertrain Repairer

Cluster Number 11 (4MOS)

16D	HAWK Missile Crew Member
16P	ADA Short Range Missile Crewman
45K	Tank Turret Repairer
94B	Food Service Specialist

Cluster Number 12 (3 MOS)

45B	Small Arms Repairer
76C	Equipment Records and Parts Specialist
76P	Materiel Control and Accounting Specialist

Cluster Number 13 (5 MOS)

52D	Power Generation Equipment Repairer
71M	Chapel Activities Specialist
72E	Telecommunications Center Operator
76W	Petroleum Supply Specialist
76Y	Unit Supply Specialist

Cluster Number 14 (2 MOS)

71P	Flight Operations Coordinator
76V	Materiel Storage and Handling Specialist

Results for BSEP II

Methodologies, as described above for BSEP I, were also used for BSEP II ratio data. The following six (6) additional indicant prerequisite competencies were identified:

Code	Indicant Prerequisite Competency
4	Time-telling measures
13	Multiplication and division
14	Fractions/decimals

Code	Indicant Prerequisite Competency
15	Geometry
38	Characteristics of verbal communication
41C	Determine the presence of a defect or extent of damage

Cluster Number 1 (3 MOS)

000	Common Soldier's Tasks
12B	Combat Engineer
94B	Food Service Specialist

Cluster Number 2 (23 MOS)

05G	Signal Security Specialist
16D	HAWK Missile Crew Member
16E	HAWK Fire Control Crew Member
17C	Field Artillery Target Acquisition Specialist
17K	Ground Surveillance Radar Crewman
26Q	Tactical Satellite/Microwave Systems Operator
54E	Chemical Operations Specialist
55B	Ammunition Specialist
61B	Watercraft Operator
63H	Track Vehicle Repairer
63W	Wheel Vehicle Repairer
67N	Utility Helicopter Repairer
67U	Medium Helicopter Repairer
67V	Observation/Scout Helicopter Repairer
68G	Aircraft Structural Repairer
71M	Chapel Activities Specialist
71P	Flight Operations Coordinator
72E	Telecommunications Center Operator
74D	Computer/Machine Operator
74F	Programmer/Analyst
91B	Medical Specialist
95B	Military Police
95C	Correctional Specialist

Cluster Number 3 (2 MOS)

32D	Station Technical Controller
43M	Fabric Repair Specialist

Cluster Number 4 (29 MOS)

11B	Infantryman
11C	Indirect Fire Infantryman
11H	Heavy Antiarmor Weapons Crewman

Cluster Number 4 (continued)

11M	Fighting Vehicle Infantryman
13B	Cannon Crewman
13F	Fire Support Specialist
15D	Lance Missile Crew Member
15E	Pershing Missile Crew Member
17B	Field Artillery Radar Crew Member
19D	Cavalry Scout
19E	M48-M60A1/A3 Armor Crewman
31V	Tactical Communications Systems Operator/Mechanic
32H	Fixed Station Radio Operator
33S	EW/Intercept Equipment Repairer
35K	Avionic Mechanic
43E	Parachute Rigger
45K	Tank Turret Repairer
52C	Utilities Equipment Repairer
55D	Explosive Ordnance Disposal Specialist
61C	Watercraft Engineer
63N	M60A1/A3 Tank System Mechanic
67G	Airplane Repairer
68B	Aircraft Powerplant Repairer
68D	Aircraft Powertrain Repairer
68F	Aircraft Electrician Repairer
68H	Aircraft Pneudraulics Repairer
68J	Aircraft Fire Control Repairer
68M	Aircraft Weapon Systems Repairer
93J	ATC Radar Controller

Cluster Number 5 (15 MOS)

13E	Cannon Fire Direction Specialist
24C	Inproved HAWK Firing Section Mechanic
24H	Improved HAWK Fire Control Repairer
27E	TOW/DRAGON Repairer
31J	Teletypewriter Repairer
31N	Tactical Circuit Controller
36C	Wire Systems Installer/Operator
36K	Tactical Wire Operations Specialist
44B	Metal Worker
45B	Small Arms Repairer
52D	Power Generation Equipment Repairer
57H	Terminal Operations Coordinator
62B	Construction Equipment Repairer
67T	Tactical Transport Helicopter Repairer
82C	Field Artillery Surveyor

Cluster Number 6 (8 MOS)

05B	Radio Operator
05C	Radio Teletype Operator
31M	Multichannel Communications Equipment Operator
71D	Legal Clerk
71L	Administrative Specialist
75B	Personnel Administration Specialist
76X	Subsistence Supply Specialist
96B	Intelligence Analyst

Cluster Number 7 (1 MOS)

71Q	Journalist

Cluster Number 8 (1 MOS)

44E	Machinist

Cluster Number 9 (4 MOS)

63G	Fuel and Electrical Systems Repairer
64C	Motor Transport Operator
76P	Materiel Control and Accounting Specialist
76Y	Unit Supply Specialist

Cluster Number 10 (1 MOS)

76W	Petroleum Supply Specialist

Cluster Number 11 (4 MOS)

16H	ADA Operations and Intelligence Assistance
16P	ADA Short Range Missile Crewman
62E	Heavy Construction Equipment Operator
67Y	Attack Helicopter Repairer

Cluster Number 12 (1 MOS)

76V	Materiel Storage and Handling Specialist

Cluster Number 13 (1 MOS)

26L	Tactical Microwave Systems Repairer

ATTACHMENT G

Module Configuration

Figures 1 and 2 below, present the derived module configurations for the BSEP I and BSEP II curricula models. The following information helps describe the graphic presentations:

1. Figure 1 presents modules for the verbal/written prerequisite competencies in categories 25 through 41 on the taxonomy.

2. Figure 2 presents modules for the numerical prerequisite competencies in categories 1 through 19 on the taxonomy.

3. Progression begins at any point labeled "Entry" and proceeds upward through Levels A, B, and C.

4. Levels A, B, and C are arbitrary distinctions that roughly equate to difficulty or to modules that require a larger number of prerequisites.

5. The taxonomy numbering system is maintained and can be used as a general guide to module contents.

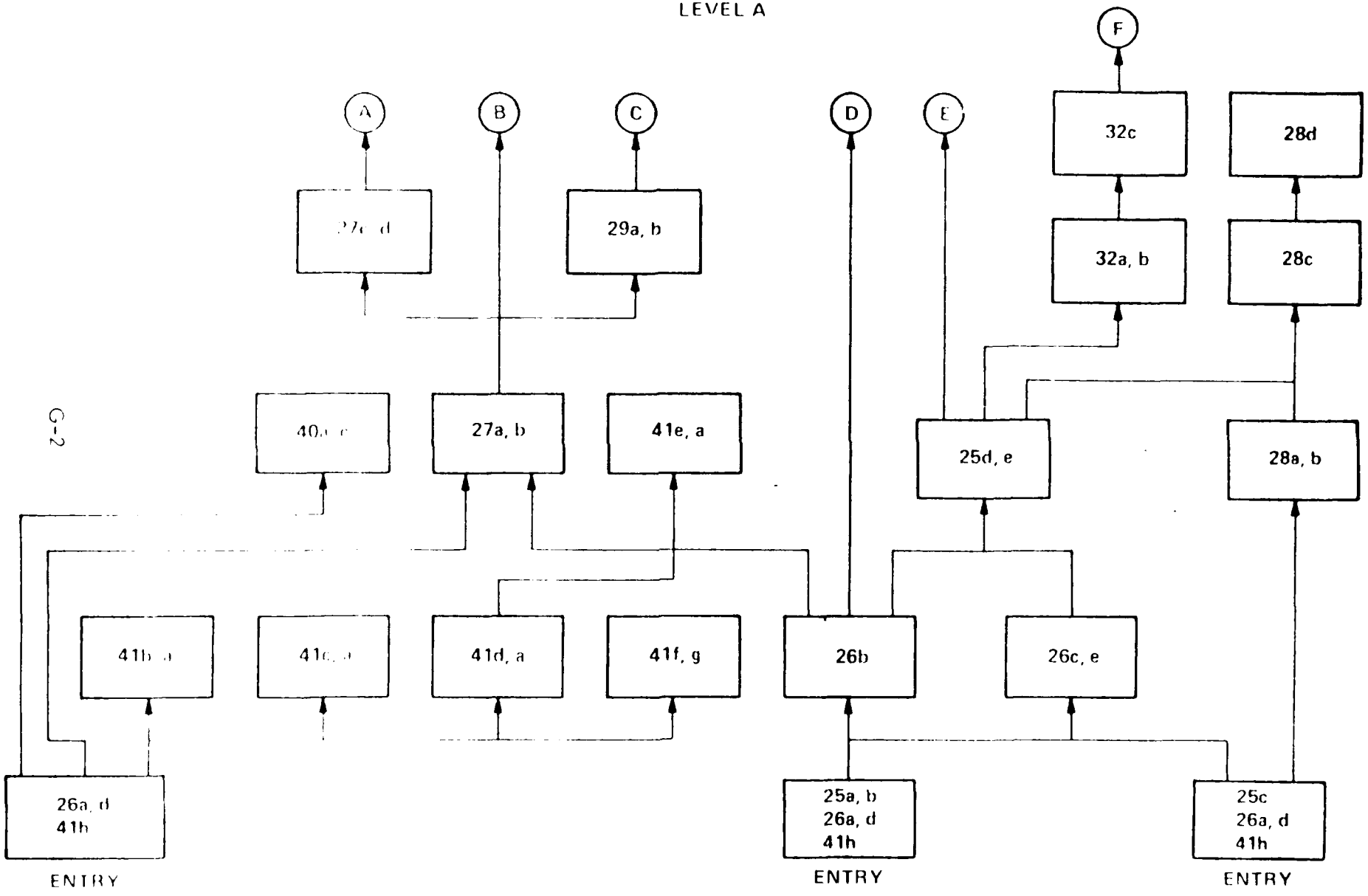

Figure 1. Module Configuration for Verbal/Written Prerequisite Competencies (Sheet 1 of 3)

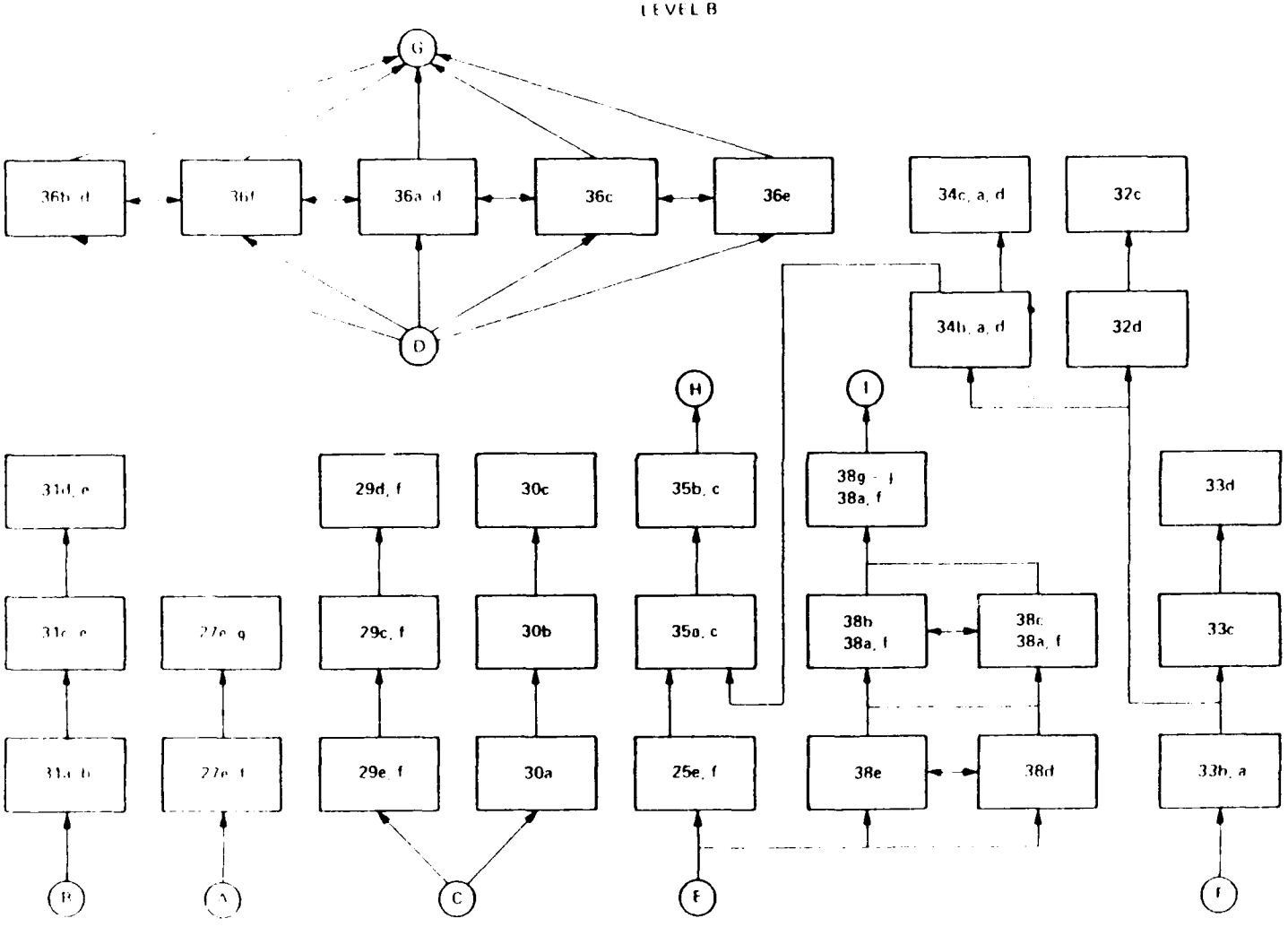

Figure E. Module Configuration for Verbal/Written Prerequisite Competencies (Sheet 2 of 3)

LEVEL C

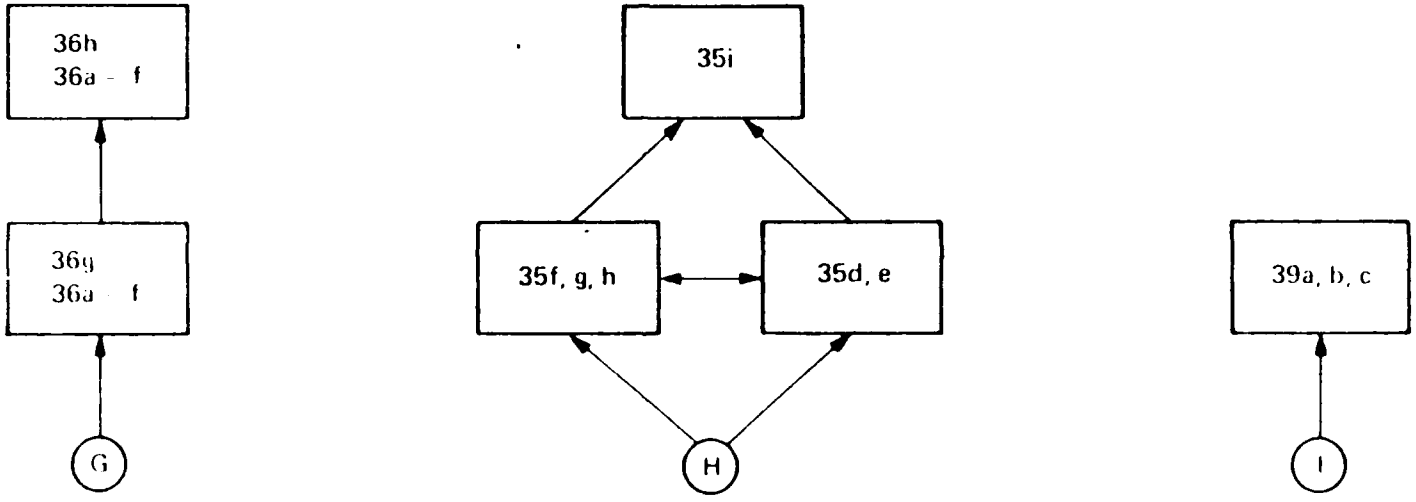

Figure 1. Module Configuration for Verbal/Written Prerequisite Competencies (Sheet 3 of 3)

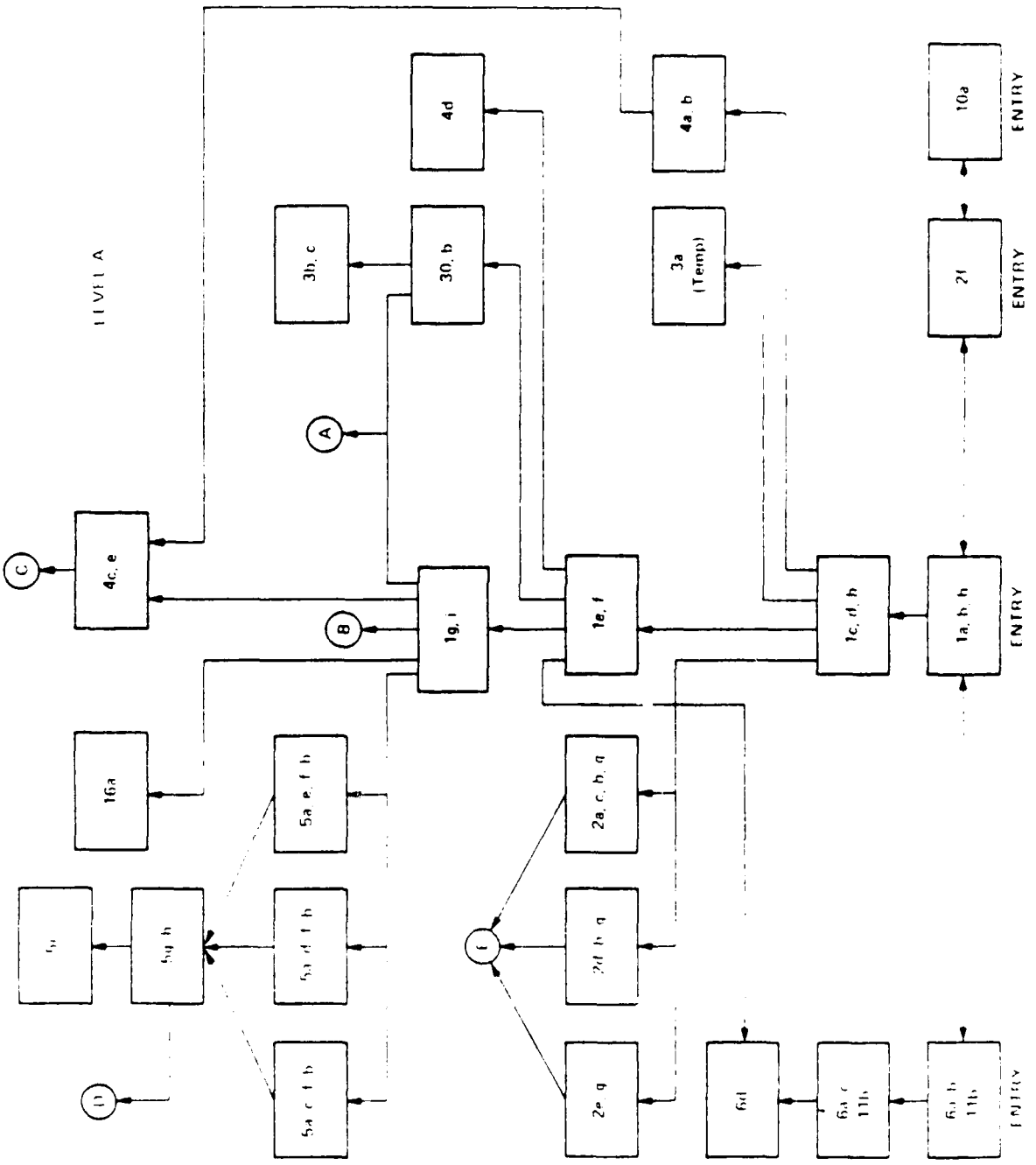

Figure 2. Module Configuration for Numerical Prerequisite Competencies (Sheet 1 of 3)

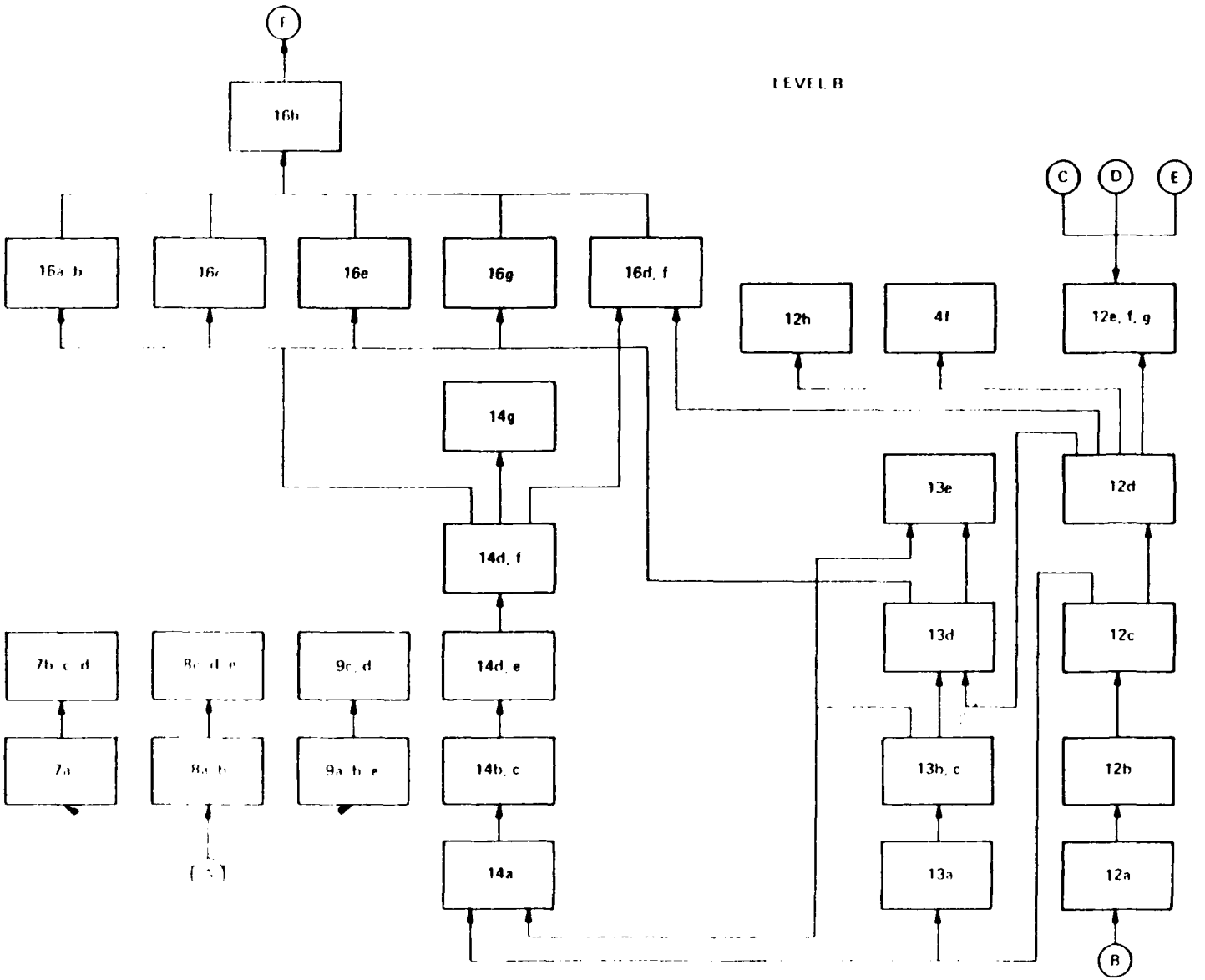

Figure [illegible] Configuration for Numerical Prerequisite Competencies (Sheet 2 of 3)

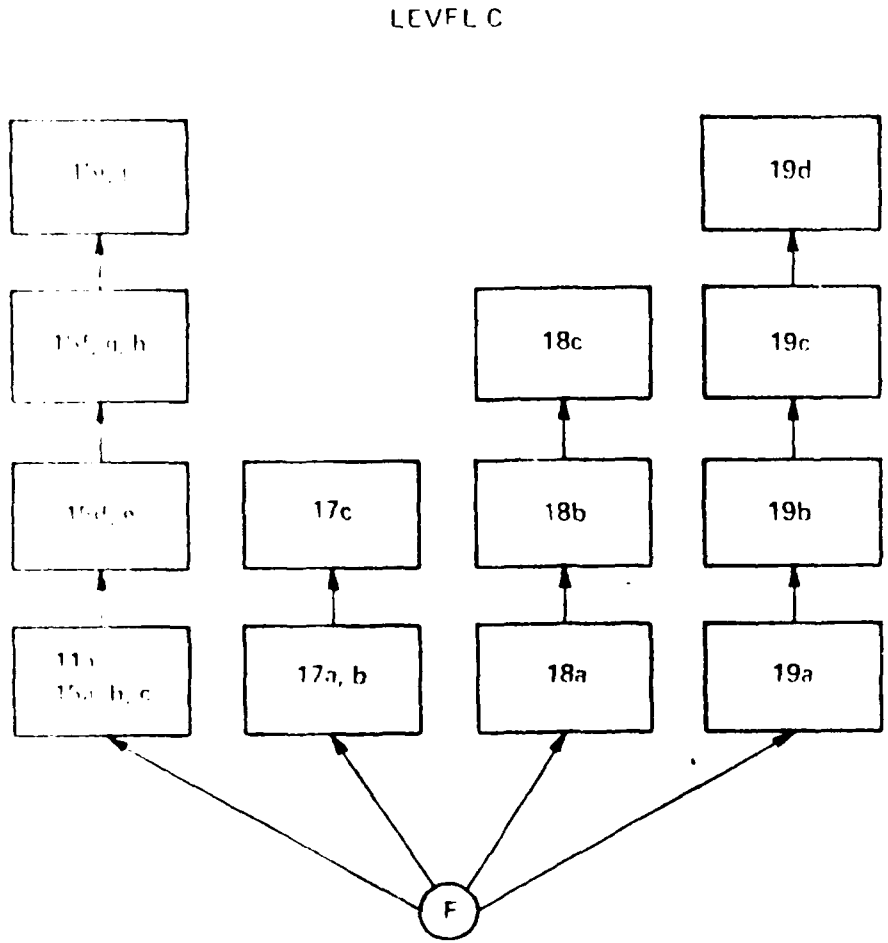

Figure 2. [illegible] Configuration for Numerical Prerequisite Competencies (Sheet 3 of 3)

ATTACHMENT H

Module Title Listing

Module No.	Module Title
1a,b,h	Numbering and Counting: Recognition and Beginning Counting
1c,d,h	Numbering and Counting: Sequencing and Other Counting
1e,f	Numbering and Counting: Ordinal Position and Place Value
1g,i	Numbering and Counting: Rounding and Number Line
2a,c,b,g	Linear Measures: Naming, System, Use, and Estimating
2d,b,g	Weight Measures: Naming, System, and Estimating
2e,g	Volume Measures: Naming, System, and Estimating
2f	Measures: Nonnumerical Calibration
3a (Temp)	Degree Measures: Temperature
3a,b	Degree Measures: Degree and Mils
3b,c	Degree Measures: Angle Estimation and Interpretation
4a,b	Time-Telling Measures: Telling Time
4c,e	Time-Telling Measures: Estimation and Conversion
4d	Time-Telling Measures: Calendar Units and Julian Style
4f	Time-Telling Measures: Greenwich Mean Time (GMT)
5a,c,f,b	Gage Measures: Identification and Interpretation of Color Divisions
5a,d,f,b	Gage Measures: Identification and Interpretation on + or - Scale
5a,e,f,b	Gage Measures: Identification and Interpretation on Multi-Scale Gage
5g,h	Gage Measures: Read Nonnumerical and Fluctuating
5i	Gage Measures: Matching to Specifications
6a,b,11b	Spatial: Direction, Manipulation, and Terminology
6a,c,11b	Spatial: Direction, Interpretation, and Terminology
6d	Spatial: Symbols and Systems
7a	Lines: Basic Identification
7b,c,d	Lines: Types and Characteristics

Module No.	Module Title
8a,b	Planes: Identification and Characteristics
8c,d,e	Planes: Types and Classifications
9a,b,e	Angles and Triangles: Identification and Characteristics of Angles
9c,d	Angles and Triangles: Identification and Characteristics of Triangles
10a	Solids: Names and Recognition
12a	Addition & Subtraction: Whole Numbers, Without Carrying or Borrowing
12b	Addition & Subtraction: Whole Numbers, With Carrying or Borrowing
12c	Addition & Subtraction: Mixed Numbers
12d	Addition & Subtraction: Positive and Negative Numbers
12e,f,g	Addition & Subtraction: Denominate Numbers
12h	Addition & Subtraction: Estimation
13a	Multiplication & Division: Whole Numbers
13b,c	Multiplication & Division: Mixed Numbers and Decimals
13d	Multiplication & Division: Positive and Negative Integers
13e	Multiplication & Division: Estimation
14a	Fractions and Decimals: Common Subdivisions
14b,c	Fractions and Decimals: Reducing and Converting Fractions
14d,e	Fractions and Decimals: Equivalents and Addition/Subtraction
14d,f	Fractions and Decimals: Equivalents and Multiplication/Division
14g	Fractions and Decimals: Estimation
15a,b,c,11a	Geometry: Identification and Terminology for Geometric Figures
15d,e	Geometry: Geometric Construction
15f,g,h	Geometry: Computations for Geometric Figures
15i,j	Geometry: Formulas and Problem Solving

Module No.	Module Title
16a	Problem Solving: Median and Mode
16a,b	Problem Solving: Median, Mode, and Averages
16c	Problem Solving: Whole, Mixed, Fraction, & Decimal Numbers
16d,f	Problem Solving: Denominate Numbers
16e	Problem Solving: Secondary Sources
16g	Problem Solving: Ratio and Proportion
16h	Problem Solving: Word Problems
17a,b	Graphing: Identification of Coordinates and Points
17c	Graphing: Matching Graph to Equation
18a	Algebra: Simple Equations
18b	Algebra: Equivalent Expressions
18c	Algebra: Powers and Roots
19a	Trigonometry: Tables of Functions
19b	Trigonometry: Tables of Logarithms
19c	Trigonometry: Solving Geometric Problems
19d	Trigonometry: Using Ratios
25a,b, 26a,d, 41h	Reading: Identifying Detail and Common Vocabulary
25c, 26a,d, 41h	Reading: Following Detail and Common Vocabulary
25d,e	Reading: Meaning and Inference
25e,f	Reading: Inference and Synthesis
26a,d, 41h	Vocabulary: Common
26b	Vocabulary: Task-Related
26c,e	Vocabulary: Context, Figurative, and Idiomatic
27a,b	Reference Skills: Identification Codes, Alphabetic and Numeric
27c,d	Reference Skills: Sourcing Skills
27e,f	Reference Skills: Scanning and Cross-Referencing
27e,g	Reference Skills: Scanning and Multiple Sources

Module No.	Module Title
28a,b	Tables and Charts: Simple
28c	Tables and Charts: Complex
28d	Tables and Charts: Applying Information
29a,b	Illustrations: Identification of Details or Parts
29c,f	Illustrations: Cross-Sectional and Usage
29d,f	Illustrations: Three-Dimensional and Usage
29e,f	Illustrations: Sequential and Usage
30a	Flow Charts: Identify and Follow Main Sections
30b	Flow Charts: Trace All Relationships
30c	Flow Charts: Infer from Symbols
31a,b	Schematics: Section and Component Identification
31c,e	Schematics: Basic Tracing and Interpretation
31d,e	Schematics: Detailed Tracing and Interpretation
32a,b	Forms: Identification and Transfer of Information
32c	Forms: Entering Information
32d	Forms: Writing Short Description
32e	Forms: Using Completed Form
33b,a	Note-Taking: Basic Organization
33c	Note-Taking: Rewrite
33d	Note-Taking: Advanced Organization
34b,a,d	Outlining: Main Ideas
34c,a,d	Outlining: Subordinate Ideas
35a,c	Report Writing: Establishing Intent
35b,c	Report Writing: Establishing Parameters
35d,e	Report Writing: Sequencing and Overall Statement
35f,g,h	Report Writing: Supporting Detail and Examination
35i	Report Writing: Justification and Alternatives

Module No.	Module Title
36a,d	Editing: Spelling Frequently Used Words
36b,d	Editing: Spelling Task-Related Words
36c	Editing: Capitalization
36e	Editing: Punctuation
36f	Editing: Grammar
36a-f, 36g	Editing: Adjusting for Coherence
36a-f, 36h	Editing: Adjusting for Clarity
38a,f, 38b	Communications: Word Usage, Expressive
38a,f, 38c	Communications: Information Content, Expressive
38d	Communications: Figurative or Idiomatic, Receptive
38e	Communications: Detailed Directions, Receptive
38a,f, 38g-j	Communications: Structuring, Expressive
39a,b,c	Communication Barriers
40a,c	Precautions: Common Knowledge and Course of Action
40b,c	Precautions: Preventive Measures and Course of Action
41b,a	Recognition: Body Language
41c,a	Recognition: Defects or Damage
41d,a	Recognition: Size, Shape, Color, & Marking Recognition
41e,a	Recognition: Size, Shape, Color, & Marking Classification
41f,g	Recognition: Sound, Sight, Smell, Touch, and Taste

Scientific and Technical Report

Executive Summary (Phase II)

CDRL Sequence No. A013

of

Contract DABT60-81-C-0017

by

RCA Service Company

Revised April 1984

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Requirement of the Report

The requirement for prerequisite competency analysis and also for prerequisite skills and knowledges analysis of the additional twenty-one (21) MOS is stated in Modification P00006, paragraph 1a-b of Attachment 6 and Exhibit A, Sequence A016, and paragraph 1c (1), (2), (3), (A), (B), (C), and (D) of Attachment 6 (SOW) and Exhibit A, Sequence A017. For purposes of orientation these requirements are restated below:

A.

1 The contractor shall conduct an analysis of tasks of the 21 MOS at Enclosure 1. The original analysis shall be performed to the substep level that clearly expresses the procedures involved in performing the task that leads to identification of the prerequisite competencies. The analysis shall be conducted utilizing procedures currently in effect. The contractor shall determine the exact number of unique task by comparing the titles of tasks previously analyzed.

A. The following data shall be submitted on an MOS by MOS basis and divided to reflect BSEP I and II components as a result of the above analysis. Data shall be delivered in hard copy 8 1/2" x 11", 20 lb. or heavier bond paper.

B. In addition to the above data, the contractor shall provide the Government with an operational summary. The summary shall discuss the MOS analysis in aggregate. It shall include discussion of interview, write-ups, substantiation procedures, full elaboration of analysis, operational details such as references used, subject matter expert utilization, date and by whom the analysis was approved, and any additional comments required to clarify the analysis.

C. The following data shall be submitted on a task basis as a result of the analysis of those MOS at Enclosure 2.

(1) The contractor shall identify the basic skills and knowledges, the safety hazards, common or special tools, test measurement and diagnostic equipment (TMDE) and other equipment associated with each step and substep of the original task analysis. Basic maintenance skills and knowledges generally have direct military application related to the field of maintenance, administration, electronics or safety. They are described in terms of principles, skills or knowledges related to the above fields. Further clarification of the skills and knowledges concept will be provided by the government as necessary. Safety hazards are related to danger to personnel or damage to equipment.

(2) The contractor shall provide a user analysis of 500 common tools and 140 items of test equipment to identify the baseline skill prerequisites and the basic skills and knowledges required to operate each. For purposes of the analysis, the operation of each tool shall be considered to be a separate task. The analysis techniques shall be identical to those used to analyze soldier's manual tasks. Reports TPA 1-3 normally prepared for tasks shall be provided for each tool. In addition, the report

of basic skills and knowledges described below shall also be prepared for each tool. The Government will furnish the list of tools and equipment for analysis.

(3) The contractor shall provide the following reports for the basic skills and tools analysis for the additional 21 MOS. Each report shall be submitted in hard copy on 8 1/2" x 11", 20 lb bond paper.

(a) An operational summary report of the procedures used during the basic skills analysis of each MOS to include interviews, approval of subject matter experts, and discrepancies.

(b) A summary description of the basic skills and knowledges profile of each MOS.

(c) A hierarchical presentation by category of the basic skills and knowledges associated with each task for each MOS. Basic skills and knowledges will be identified by step and substep of the original analysis. Report format of the TPA-2 is appropriate.

(d) For each MOS, separate lists (in order of priority established by frequency of use) of all common tools, of all special tools, of all test equipment (TMDE), of all basic skills and knowledges, and of other equipment used by the MOS.

Definition of Terms

Throughout this report certain terms are used to express the original or operationally defined intent of processes or products. These terms and their respective definitions are listed below.

1. Additional Analysis
   Twenty (20) MOS for which original analysis of tasks was required under this phase of the effort. Titles of the MOS are listed at Attachment A.

2. Further Analysis
   A process of identifying tools/TMDE and technical skills and knowledges (TSKS) for tasks within an MOS. A list of the MOS to which further analysis processes were applied is at Attachment B.

3. Generic
   Applied on the project in the following ways:
   a. A type of analysis process used to identify procedures, technical skills and knowledges (TSKS), and tools/TMDE associated with task performance.
   b. A type of task. A list of 1080 task statements was provided as GFM. The task statements were written to apply to major systems, subsystems, assemblies, or subassemblies that exist on major types or categories of equipment or vehicles. One or more maintenance functions was included in each task statement.

4. Technical Skills and Knowledges (TSKS)
   Objective statements obtained via an interview with an SME or from analyst research of GFM as verified by an SME which can be considered to be the skills and knowledges necessary and/or related to performance of tasks as described by the procedures identified during the analysis of generic tasks.

Format of Report

In addition to the requirements and definitions sections included above, the report contains the following sections: Analysis at Ft. Gordon and Ft. Sam Houston, Analysis of Generic Tasks, Tool Analysis, Reports, Observations and Recommendations.

Analysis at Ft. Gordon and Ft. Sam Houston

Three (3) MOS (31E, 36H, 72G) were analyzed at Ft. Gordon and three (3) MOS (76J, 91E, and 92B) were analyzed at Ft. Sam Houston. These analyses were conducted by primarily using procedures in effect on 1 October 1982. (For details of these procedures refer to Operational Summary Report (CDRL A004, dated 23 June 1983.) The following adjustments were made to the procedures:

1. Instructional review and replicate analysis procedures were not used.
2. The use of two job aid designations was discontinued.
3. Cross references were not used and subtask procedures were emphasized.
4. Analysis results were expressed in a more general manner.
5. Results were reviewed and revised prior to processing.

Analysis of Generic Tasks

Analysis was completed for a list of 1080 generic tasks provided by the USAOC&S. The list actually consisted of task statements. Originally no information was provided as to conditions, standards, MOS designation, or skill level designations. Consequently, the following major actions were involved in analysis of the list of 1080 generic tasks:

1. Designation of MOS. In order to assign analysts and obtain services of SME, some designations were needed as to how the generic task list applied to MOS and what major equipment was involved with performance of the various tasks. First, tasks were assigned to various locations (Aberdeen Proving Ground, Ft. Knox, and Ft. Jackson). Ft. Leonard Wood was added later as an analysis site. Second, most tasks were designated as being in one of the following groups: all automative, wheel vehicle, track vehicle, or turret. Third, a preliminary listing of major end items of equipment was developed for each grouping. And fourth, with the assistance of SME and other service school personnel, MOS designations, task groupings, and equipment designations were made or verified as part of the analysis effort.

2. Scope of tasks. Statements on the list of 1080 generic tasks were quite heterogenious. Some were quite discrete as to level of action required and the object to which the action was applied. Others were broad and general and quite complex with regard to action. As a result, discrete tasks were frequently analyzed first and the results included with other results for a more general or complex task. USAOC&S personnel referred to this latter process as "rolling up" a task, or seeking a higher level of genericism.

3. Identification of technical skills and knowledges (TSKs). One of the main efforts associated with analysis of the 1080 generic tasks was the identification of TSKs. As analysts worked to

identify TSKs, processes were refined and various factors were considered. Consideration was given to the following:

a. Recognition that TSKs are associated with how an end item, system subsystem, assembly or subassembly operates (works) and/or how (or why) procedures (steps in a task) are preformed. The main frame of reference for an analyst is: what are the areas of commonality, generalizability, or transferability across the various procedures or elements of the task and how can they be expressed as TSKs? For the USAOC&S the issue is stated as follows: If the TSKs are instructed are they the skills and knowledges a soldier needs to perform a maintenance function across a considerable inventory of equipment?

b. Whether TSKs identified are essential for task performance is an issue that must be addressed empirically. The present effort explored the issue in a judgement manner through the use of a single review committee.

c. Analysts were quick to recognize applicability of TSKs across a range of tasks. Accordingly, a TSK coding system was developed and is at Attachment C. Use of the coding system allows for sorting and printing via data processing equipment.

Tool Analysis

As part of the effort at the USAOC&S a user analysis was required for tools and TMDE. General procedures enacted were as follows:

1. Categorization of items. The list of tools and TMDE for which analysis was required was provided as GFM. Initial review of the list lead to the conclusion that efficiency in analysis, and subsequent coding, could be gained if tools were categorized. Accordingly, functional categories and subcategories were formed for the tool and TMDE items. The intent was to perform a single analysis for each subcategory. As the analysis progressed changes were made in the categories and subcategories. Also, additional tools were identified, but their use was not analyzed. A complete listing is provided at Attachment D.

2. Format for results. A standard format was developed for analysis results. The major steps included procedures for use, care/maintenance, and safety. TSK were identified, as were prerequisite competencies.

3. Coding to generic tasks. As part of the analysis process for generic tasks, the tools necessary to perform each major step were identified. Analysts coded the tools identified by specific number or by subcategory or category designation. These codings were reviewed by the review committee.

4. Development of job aid. To assist with the analysis and identification of tools, a tool catalog was developed. The catalog contained names, pictures, national stock number (or other identifiers), and short descriptions for each tool. A copy of the completed catalog has been provided to the Government.

Reports

The following reports resulted from this phase of the analysis effort:

1. TPA-1, TPA-2, and TPA-3 (analysis results) for MOS at Ft. Gordon, Ft. Sam Houston, and the 1080 generic tasks at the USAOC&S.

2. TPA-3 reports consisting of tools and TSKs for eight (8) MOS, originally analyzed under the 94 - MOS effort.

3. Task statement list.

4. Discrepancy statements.

5. MOS baseline skill profiles.

6. Subtask statement list.

7. Tool analysis results.

8. An operational summary report.

9. Cluster of TSKs for 117 task groupings developed by the USAOC&S.

10. Summary of TSKs for 35 field entries from the TSK coding system as selected by the USAOC&S.

Observations and Recommendations

The following general observations and recommendations are offered based on the analysis effort completed in this phase.

1. In effect analysis procedures can be effectively and efficiently employed with trained analysts and service school personnel who have been adequately briefed on the analysis process.

2. The main factor in determining the extent of an analysis effort (the amount of time needed to analyze tasks) is the quality of the task statements. To the extent that task statements are complete and accurate analysis will proceed smoothly. If a task list has not been formalized, it is recommended that analysts proceed with analysis but that they be readily supported by training developers who can clarify discrepancies.

3. Analysis of generic tasks (tasks listed similarily to those provided on the 1080 list) can be effectively untaken within the following guidelines:

   a. Tasks should be written in the normal three part format. If this is not desired, then analysis results should be considered as preliminary in nature until tasks have been more completely developed and there is a chance to revise analysis results.

b. Standard definitions of maintenance functions (or other doctrinal descriptions) should be utilized. If part of a generic analysis effort is to redefine or reexamine doctrine, then a preliminary field-oriented study should be conducted for this purpose. Once new or adjusted doctrine has been stated, then the analysis process can be guided by it.

c. Generic analysis results merit extensive review. The review should focus on the extent to which the general procedures and TSKs are applicable across task elements and/or MOS. The review groups should be composed of SME from MOS to which the generic tasks ostensibly apply.

d. The identification of TSKs should be coupled with an attempt to determine empirically if they are essential to task performance. This could be pursued in either of two manners. First, an attempt could be made to describe and identify job holders who are "masters" based on job performance. Once identified they could be tested to ascertain if they "know" the TSKs. Second, a comparison could be made of soldiers who are trained on TSKs and those who have not been trained.

e. Generic task analysis procedures are a significant departure from the normal mode of operation. If they are utilized, well organized briefings must be provided service school personnel as to the potential impact of the analysis results on subsequent training operations activities.

ATTACHMENT A

Listing of Additional 20 MOS by Title

MOS	MOS Title
31E	Field Radio Repairer
36H	Dial/Manual Central Office Repairer
72G	Data Communicati on System Specialist
76J	Medical Supply Specialist
91E	Dental Specialist
92B	Medical Laboratory Specialist
41C	Fire Control Instrument Repairer
45D	Field Artillery Turret Mechanic
45E	M1 Tank Turret Mechanic
45G	Precision Electronics Repairer
45L	Artillery Repairer
45N	M60A1/A3 Tank Turret Mechanic
45T	ITV/IFV/CFV Turret Mechanic
63B	Light Wheel Vehicle/Power Generation Mechanic
63D	Self-Propelled Field Artillery System Mechanic
63E	M1 Tank System Mechanic
63J	Quartermaster and Chemical Equipment Repairer
63S	Heavy Wheel Vehicle Mechanic
63T	ITV/IFV/CFV System Mechanic
63Y	Track Vehicle Mechanic

ATTACHMENT B

Listing of 22 MOS Further Analyzed

Analysis Location	MOS
Aberdeen Proving Ground, MD	44B*
	44E*
	45B*
	45K*
	63G*
	63H*
	63W*
Fort Knox, KY	63N*
Aberdeen Proving Ground, MD	41C
	45G
	45D
	45L
	63J
Fort Knox, KY	45E
	45N
	45T
	63D
	63E
	63T
	63Y
Fort Jackson, SC	63B
	63S

* Original analysis conducted as part of the 94-MOS effort.

ATTACHMENT C

TSK Coding

CONTRACT NO. DABT60-81-C-0017

T S K C O D I N G S

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PAGE 1

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FIELD ONE

01 TOOLS: ACCESSORIES	27 TOOLS: SEWING DEVICES	55 TRANSMISSION SYSTEMS
02 TOOLS: BLADES	28 TOOLS: SHEARING DEVICES	56 LUBRICATION SYSTEMS
03 TOOLS: BRUSHES	29 TOOLS: SOLDERING MAT'L & EQUIP	57 MECHANICAL
04 TOOLS: CLAMPS/VISES	30 TOOLS: SURFACING TOOLS	58 NBC EQUIPMENT
05 TOOLS: COMPRESSORS	31 TOOLS: TEST EQUIPMENT (NON-ELECTRIC)	59 TURRET COMPONENTS
06 TOOLS: CONTAINERS	32 TOOLS: THREADING DEVICES	60 VEHICLE: DRIVE
07 TOOLS: DRILLS/DRILL BITS	33 TOOLS: WELDING DEVICES	61 AUXILIARY POWER UNITS & CONTROLS
08 TOOLS: ELECTRONIC TESTING EQUIPMENT	34 TOOLS: WRENCHES	62 VEHICLE: RECOVERY
	35 TOOLS: EXPENDABLE MAT'L & SUPPLIES	63 VEHICLE: PMCS
		64 POWER TRAINS
09 TOOLS: GENERATORS	36 BODY COMPONENT	65 QUARTERMASTER EQUIP
10 TOOLS: GUNS/PUMPS	37 BRAKE SYSTEMS	66 CHEMICAL EQUIP
11 TOOLS: HAMMERS	38 COOLING SYSTEMS	67 WHEELS
12 TOOLS: INSPECTION DEVICES	39 ELECTRICAL SYSTEMS	68 CHASSIS
13 TOOLS: KITS	40 ENGINE ASSEMBLY	69 TOWING
14 TOOLS: LATHES	41 EXHAUST SYSTEMS	
15 TOOLS: LIFTING DEVICES	42 FILTERS	
16 TOOLS: MARKING DEVICES	43 FIRE CONTROL SYSTEMS	
17 TOOLS: MEASURING DEVICES	44 FORMS	
18 TOOLS: METAL SHAPING DEV.	45 FUEL SYSTEMS	
19 TOOLS: PLIERS	46 HULL COMPONENTS	
20 TOOLS: PRESSES	47 HYDRAULIC SYSTEMS	
21 TOOLS: PROTECTIVE CLOTHING & DEVICES	48 KITS	
	49 ORDNANCE (WEAPONS)	
22 TOOLS: PRYING DEVICES	50 POWER PACKS	
23 TOOLS: PULLERS	51 SAFETY COMPONENTS	
24 TOOLS: PUNCHES/CHISELS	52 STEERING SYSTEMS	
25 TOOLS: SAWS	53 SUPERVISION	
26 TOOLS: SCREWDRIVERS	54 SUSPENSION SYSTEMS	

****

FIELD TWO

A ADJUST (ALINE)	O REMOVE (OFF)
C CLEAN	P REPAIR
E EXPEDITE (PROCESS)	R REPLACE
F FAULT ISOLATE	T TEST
L INSPECT (LOOK)	U USE (OPERATE)
M INSTALL (MOUNT)	V SERVICE (MAINTAIN)
	S SYSTEM

****

FIELD THREE

01 ACCESS	30 DRY	60 ORGANIZE	91 TRAVERSE
		61 POSITION	
02 ADJUSTMENT	31 ENERGY	62 POSSESS	92 VELOCITY
03 ALINE	32 EXPLODE	63 POWERE	93 VERIFY
04 APPLY	33 EXPIDITE	64 PRESS	94 VIBRATE
05 ASSEMBLE	34 FORCE	65 PRESSURE	95 WEAR
06 ASSURE	35 FRICTION	66 PROTECT	96 WEIGHT
07 BALANCE	36 FUSING	67 RADIATE	97 WET
08 BIND	37 GRIND	68 REASSEMBLE	98 X-RAYS
09 BLIND	38 GROUND	69 RELEASE	99 ESTIMATE
10 BRAKE	39 HANDLE	70 REMOVE	100 DIRT
11 BROKEN	40 HEAT	71 REPAIR	101 COMMUNICATE
	41 IDENTIFY		
12 BURN	42 IMPACT	72 REPLACE	102 CLEARANCE
13 CIRCUIT	43 INJURE	73 RESIST	103 LEVERAGE
14 CLEAN	44 INSULATE	74 ROUND	104 SEAL
15 CLOGGED	45 INSPECT	75 ROTATE	105 SOUND
16 COLOR	46 INSTALL	76 RUPTURE	106 SHARPEN
17 CONDUCT	47 JAMMING	77 SAFETY	107 LEVEL
18 CONNECT	48 JOIN	78 SECURE	108 PROCEDURE
19 CONTROL	49 LEAK	79 SIZING	109 PREVENTION
20 CORROSION	50 LIFT	80 SERVICE	110 STRENGHTEN
		81 SHAPE	111 WEAKEN
21 CRACK	51 LIGHT	82 SHOCK	
22 CUT	52 LOCK	83 SIGHT	
23 DAMAGE	53 LOOSEN	84 SPECIFY	
24 DENT	54 LUBRICATE	85 SUPPORT	
25 DETERMINE	55 MAINTAIN	86 SUSPEND	
26 DIODING	56 MARK	87 TENSION	
27 DIRECT	57 MEASURE	88 TEST	
28 DISSOLVE	58 MOTION	89 TIGHTEN	
29 DRILL	59 MOUNT	90 TORSION	

ATTACHMENT D

Tool Coding

T01	Accessories
T02	Blades
T03	Brushes
T04	Clamps/Vises
T05	Compressors
T06	Containers
T07	Drills/Drill Bits
T08	Electronic Testing Equipment
T09	Generators
T10	Guns/Pumps
T11	Hammers
T12	Inspection Devices
T13	Kits
T14	Lathes
T15	Lifting Devices
T16	Marking Devices
T17	measuring Devices
T18	Metal Shaping Devices
T19	Pliers
T20	Presses
T21	Protective Clothing & Devices
T22	Prying Devices
T23	Pullers
T24	Punches/Chisels
T25	Saws
T26	Screw Drivers
T27	Sewing Devices
T28	Shearing Devices
T29	Soldering materials and Equipment
T30	Surfacing Tools
T31	Test Equipment (Non-Electric)
T32	Threading Devices
T33	Welding Devices
T34	Wrenches
T35	Expendable Materials and Supplies

Scientific and Technical Report

Executive Summary (Phase III)

CDRL Sequence No. A013

of

Contract DABT60-81-C-0017

by

RCA Service Company

30 April 1984

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10. Prerequisite Competency - A statement taken from the taxonomy developed on this effort.

11. Pretest - A preliminary collection of test items assembled for the purpose of pretesting as part of the test development process.

12. Subtest - A short test (approximately 10 items) assembled after pretesting to relate to one or more prerequisite competencies.

13. Taxonomy - A statement of skills developed on the effort. The skills are directly related to task performance and are based on excerpts from ETAPS related to skills and knowledges that underlie task performance.

Format of Report

In addition to the Requirements and Definitions sections included above, the report contains the following sections: Background; Test Development, Administration, and Data Collection; BSEP Locator; BSEP Subtests Congruence; BSEP/ASVAB Congruence; BSEP Test/Performance Test Congruence; BSEP Test Appropriateness; and Recommendations and Conclusions.

Background

One component of the U.S. Army Basic Skills Education Program (BSEP) contract, which began in April 1981, was the development of a series of tests designed to identify soldiers who lacked the basic skills required for their MOS. These diagnostic tests were developed using data derived from analyzing tasks associated with 94 MOS plus Common Soldiers Tasks using the Extended Task Analysis Procedures (ETAP). This combination of task analysis and test development presented a unique opportunity to develop a diagnostic tool closely related to the actual skills required by a soldier day-to-day on the job. Test items were developed based upon prerequisite competencies identified during the analysis phase of the contract. These prerequisite competencies were compiled in a taxonomy developed especially for this project.

Following initial development, the test items were assembled into pretest formats and pretested on samples of AIT students. They were then reviewed by expert judges. Following analysis of pretest data and review of information from judges, test items were assembled into final test forms. All of this occurred during Phase I of the contract.

During Phase II of the contract the diagnostic tests were given to a large sample of students. The intent was to discover the validity of the tests developed for the BSEP [illegible]. To this end a quasi-experimental design was employed. Such a design was [illegible] true experimental design, with full control over the [illegible] randomization of an examinee population,

Requirement of the Report

The requirement for development of this executive summary is stated in CDRL Sequence Number A015, Attachment to Modification P00006 of Contract DABT60-81-C-0017. A full description of the required effort is given in the subject contract.

Definition of Terms

Throughout this report certain terms are used in a very specific context. The definitions of these terms are as follows:

1. Aptitude Area - A means of stratifying examines based upon their MOS. The nine aptitude areas covered in this study include: clerical (CL), combat (CO), electrical (EL), field artillery (FA), general maintenance (GM), mechanical maintenance (MM), operators/food (OF), surveillance communications (SC), and skilled technical (ST).

2. ASVAB Tests - Armed Services Vocational Aptitude Battery. The comparison with performance on these already existing tests were used to test the validity of the BSEP tests.

3. BSEP Tests - Tests developed by ETS and RCA as part of the Basic Skills Education Program. These tests consist of a mathematics locator, a verbal locator, 69 mathematics subtests and 59 verbal subtests. (For a complete listing of all subtest titles, see Attachment A).

4. Category - In this report a category refers to a grouping of subtests, such as all subtests with the title numeric (NU), vocabulary (VO), etc.

5. Criterion Exercise - Tests, stressing performance of an action, developed to test the validity of the BSEP tests. See Performance Test.

6. ETAP - Extended Task Analysis Procedures. A comprehensive approach to task analysis with provisions for action and hierarchial analysis and knowledge analysis.

7. Item Analysis - A review of questions on locator tests and subtests performed by panels of experts to determine face and content validity.

8. Locator Test - A short test (30 items) for which raw scores are used to predict scores on subtests; established based on performance of students in pretest samples; bears only a general content relationship to particular subtests.

9. Performance Tests - Tests developed as criterion exercises employing a structured response approach. They were used to test the validity of the BSEP tests.

The validation was broken down into four parts, or efforts, which overlapped one another. During Part I the diagnostic (BSEP) tests were tested for internal validity. Two locator tests, one verbal and one math, had been developed to screen students. Missing an item or items on a locator test directed a student to a specific subtest or subtests. Success or failure on the locator test was compared with success or failure on the related subtests. The results were then analyzed statistically. The second effort involved testing the validity of the BSEP tests against a group of tests already in operation in the Army, in this case the ASVAB tests. Each locator was compared to a group of related ASVAB subtests. The combined locators were compared to ASVAB composite scores Finally, each individual BSEP subtest was compared to each ASVAB subtest. The third effort involved testing the validity of the BSEP tests against a set of performance tests. The performance tests were developed especially for this effort by modifying the BSEP tests into structured response exercises. These performance tests were compared to their related BSEP locator test. Then all the performance subtests within a given aptitude area were compared to all the BSEP tests within that same area. The final effort scrutinized the appropriateness of the BSEP tests on a item by item basis. Teams of Government experts were asked to examine the test items and rate them on a number of scales. The results of those ratings were used to further improve the test items.

Test Development, Administration, and Data Collection

The test population consisted of a number of strata differing in their characteristics because they already had been selected for and sorted into different aptitude areas by the U.S. Army. The stratified sample was composed of the following nine aptitude areas: 1. Clerical (CL), 2. Combat (CO), 3. Electronics (EL), 4. Field Artillery (FA), 5. General Maintenance (GM), 6. Mechanical Maintenance (MM), 7. Operators/Food (OF), 8. Surveillance/Communications (SC), and 9. Skilled Technical (ST). Randomization, while unfeasible to achieve with this population, was achieved with reference to the packaging of the BSEP subtests.

Beginning in May 1983 and continuing throughout mid-November 1983, a population of 19, 462 examinees in the BSEP I category and 2,214 examinees in the BSEP II category were given the BSEP tests. In addition, 1021 examinees in the BSEP I category and 488 examinees in the BSEP II category were given the BSEP performance (criterion) tests.

The task of administering the tests was delegated to personnel located at the testing site. These were persons already employed by the military establishment or hired specifically to administer the BSEP tests. Each test administrator was provided with a handbook containing instructions specific to the test. This handbook was of sufficient clarity and emphasis so that the administrators could establish and maintain a standardized test environment so that test results could be obtained under circumstances essentially alike for all examinees.

A special form was designed, Basic Skills Examination (NCS Trans Optic EB01-12483-3), to be used with an optical scanner. These response sheets provided the raw data for the validation. A number of procedural steps were instituted to insure quality control of the data. The forms were then run through an optical mark reader. The final step was to send the output record to a host computer for final processing and report writing.

BSEP Locator/BSEP Subtests Congruence

The BSE P tests consist of two locator tests (mathematics and verbal), sixty nine (69) mathematics subtests, and fifty nine (59) verbal subtests. Attachment A lists the subtests by number and title. The locator tests are designed to provide a general measure of basic skills functioning which can be used to point out or locate potential basic skills deficit areas to be further investigated using the various subtests. Each locator test contains thirty (30) items. By using the locator tests the amount of testing time could be reduced by predicting which subtests a soldier would be most likely to pass or fail. The soldier would be administered only those subtests for which the pass/fail status was uncertain.

The validation effort attempted to answer the question, "To what extent do the locator tests empirically predict success or deficiencies on specific subtests of the BSEP tests?" The sample for BSEP I consisted of 19,462 Army personnel, representing 92 MOS at 20 different military locations. The sample for BSEP II consisted of 2,214 Army personnel, representing 81 MOS at 28 sites plus an undetermined number of sites from USAEUR and WESCOM. These students were stratified into nine aptitude areas based on MOS for BSEP I. The relatively low number of BSEP II students made the breakdown into aptitude areas unfeasible. For this reason BSEP II students were considered collectively.

All students took the locator tests. Time constraints, however, permitted only a certain number of subtests to be taken. To facilitate test administration the 128 subtests were divided into seven (7) packages. The objective was to test an equal number of soldiers on an equal number of tests. The tests were randomly assigned to each of the packages. These in turn were assigned to soldiers within each MOS grouping (aptitude area) for an equal distribution of all tests. Data on results from the locator tests and individual subtests were then analyzed. Pearson product moment correlations were run between the mathematics locator test and the mathematics subtests and between the verbal locator test and the verbal subtests. The correlations were run for each aptitude area for BSEP I and collectively for BSEP II. High correlations would indicate that success or failure on the locator test is indeed predictive of success or failure on the subtests. The results of this analysis are briefly summarized in Figures 1 through 4.

Figure 1 is a summary of the correlations between the mathematics locator and the mathematics subtests for BSEP I. For reporting ease the 69 mathematics subtests have been grouped into seven (7) categories. The figures are cumulative for all nine aptitude areas. So the 12 subtests in the numeric (NU) category are multiplied by the nine aptitude areas to get a total of 108 subtests.

The numbers in the blocks show how many subtests within each category correlated with the mathematics locator within a certain range. Two of the numeric subtests had correlations in the .89- .80 range, 38 in the .79- 70 range, 33 in the .69-.60 range and so on. Examining the summary reveals that a majority of the subtests had correlations above .50. The strongest correlations are in the numeric (NU), computation (CO), and measurement (ME) categories. By far the weakest correlations are within the trigonometry and logarithms (TR) category..

Figure 2 presents the mathematics locator to mathematics subtests correlations for all BSEP II students regardless of aptitude area. Again the vast majority of correlations are above .50 with numeric (NU), computation (CO), and measurement (ME) showing the strongest correlations. Also once again the weakest correlations are in the trigonometry and logarithms (TR) category.

Figure 3 summarizes the BSEP I correlations between the verbal locator and the verbal subtests for all aptitude areas. The majority of correlations are above .40. The strongest correlations are in the categories: procedural directions or prose (PR), flow charts (FC), report writing (RW), verbal communication (VC), and vocabulary (VO). The weakest correlations are in the categories precautions (PR) and recognition (RE).

Figure 4 summarizes the correlations between the verbal locator and the verbal subtests for BSEP II regardless of aptitude area. The majority of correlations fall above .50. The strongest correlations are in the categories: verbal communication (VC), flow charts (FC), schematics (SC), report writing (RW), procedural directions or prose (PD), and vocabulary (VO). Again the weakest correlations are in precautions (PR) and recognition (RE).

BSEP/ASVAB Congruence

The BSEP/ASVAB congruence represents another approach at criterion - related validation of the BSEP tests. For this purpose, performance on the BSEP tests was checked against a criterion which is a direct and independent measure of that which the BSEP tests are designed to predict. The validation question concerning the BSEP/ASVAB congruence was: "To what extent does performance on a locator test and subtest of the BSEP tests correlate with subtests and composite scores on the ASVAB?"

Since the ASVAB has been used by the U.S. Army as a predictor of both success in MOS training and success on the job, validation of the congruence between the BSEP tests and the ASVAB is considered an appropriate indicator of concurrent validity of the BSEP tests. It was unfeasible to extend the validation procedures over the time required for predictive validity or to obtain an Army preselection sample for testing purposes. Therefore, the BSEP tests were administered to groups of soldiers on whom criterion data were already available. As stated earlier, the sample for BSEP I was 19,462 students in nine (9) aptitude areas representing 92 MOS at 41 different sites.

Once the data were collected, Pearson product moment correlations were calculated in three parts. The BSEP mathematics locator test was correlated with the sum of three ASVAB tests: arithmetic reasoning (AR), math knowledge (MK), and numerical operations (NO). The BSEP verbal locator was correlated with the sum of two ASVAB tests: word knowledge (WK) and paragraph comprehension (PC). Finally the total BSEP locator tests (math plus verbal) were correlated with ASVAB composite scores which were based on aptitude area. Figure 5 summarizes the results of these correlations.

The first section of Figure 5 shows the correlations between the BSEP math locator and the sum of three ASVAB numerical subtests reported by aptitude area. The correlations are both high and uniform ranging only from .66 to .73. The second section of Figure 5 shows the correlations between the verbal locator and the sum of two ASVAB verbal subtests. Again the correlations are high and uniform with a range from .60 to .74. The third section shows the correlations between the total BSEP locator (math plus verbal) and the ASVAB composites. The correlations are again high although a much greater range is displayed, from .46 in the Clerical aptitude area to .78 for Field Artillery. The differences in the total locator correlations as compared to the individual math or verbal locator correlations probably results from the inclusion with the composite of ASVAB tests, such as auto/shop information (AS) or general science (GS), whose relationship to math and verbal locator tests were expected to be tenuous.

Correlations were also made between each individual BSEP subtest and each ASVAB test. Even a summary of these extensive data is outside the scope of this report. For a summary, refer to the Scientific and Technical Report, MOS Test Validation. Because every BSEP subtest was compared with every ASVAB test, caution should be used in analyzing these data. Many of the low correlations are between tests for which no relationship was expected.

BSEP Test/Performance Test Congruence

A series of performance tests was developed in order to find out to what extent performance on the BSEP locator tests and subtests correlate with performance on criterion exercises developed for specific prerequisite competencies. The approach utilized was to develop a separate set of test items drawn from the same domain as the existing BSEP tests, but organized in a different format. The performance (criterion) tests were developed to achieve the following results:

1. Reduce the element of guessing by requiring a constructed response.

2. Reduce, as much as possible, any reading problems the soldier may have by having the test administrator read out loud the instructions and test questions.

3. Attempt to have the soldier perform a specific act.

To insure that the performance tests measured the correct prerequisite competencies, the existing BSEP tests were modified to achieve the aforementioned aims.

The performance tests were administered to 1621 students in 33 MOS. The data were then analyzed and correlations were calculated based on performance on the BSEP locator tests and the individual performance subtests. Figures 6 and 7 summarize the results of this analysis.

Figure 6 shows the correlations between the mathematics locator test and the mathematics performance subtests. A definite majority of correlations fall above .50. The highest correlations were in the computation (CO), numeric (NU), and measurement (ME) categories. The lowest correlations were in the trigonometry and logarithms (TR) category.

Figure 7 shows the correlations between the verbal locator test and the verbal performance subtests. The majority of correlations fall above .40. The highest correlations are in the categories procedural directions or prose (PD), flow charts (FC), and schematics (SC). The lowest correlations are in the categories precautions (PR) and illustrations or diagrams (IL).

Correlations were also calculated between each individual BSEP subtest and each individual performance subtest. Figure 8 summarizes the correlations between the BSEP mathematics subtests and the performance verbal subtests. The majority of correlations fall above .30. The highest correlations are in the categories numeric (NU) and computation (CO). The lowest correlations are in the category trigonometry and logarithms (TR). Figure 9 summarizes the correlations between the BSEP verbal subtests and the performance verbal subtests. The majority of correlations fall above .20. The highest correlations are in the categories procedural directions or prose (PD), flow charts (FC), and schematics (SC). The lowest correlations are in the categories illustrations or diagrams (IL), note-taking (NT), and precautions (PR). Clearly there is a large discrepancy when comparing the BSEP locator/performance subtest correlations and the BSEP subtest/performance subtest correlations. The reasons for this discrepancy are, without further analysis, difficult to ascertain.

BSEP Test Appropriateness

The BSEP locator tests and subtests were also evaluated using a "panel of experts" approach. Face validity, the subjective evaluation of what a test appears to measure, was taken into consideration, despite its subjectiveness, by the experts. Content validity was built into the BSEP tests from the beginning by a thorough examination of the task analysis and the test specifications that were drawn up for the item writers. The task of the reviewers was to examine the tests to determine how well the items in a test or subtest represented the prerequisite competencies being tested. The review was actually made up of three parts: 1. TRADOC Review, 2. Government Experts Review, and 3. RCA Review. For more details on how the reviews were conducted and for an item-by-item evaluation of the items, refer to section 5 of the Scientific and Technical Report, MOS Test Validation.

A brief summary of some of the major findings of these reviews follows:

1. The discriminators did a good job in determining the difference between "knowing and not knowing".

2. There were problems in the wording of some stems, particularly with the use of the words "not" and "except".

3. There was no evidence to suggest that any "patterning" of item responses existed which would have skewed the results of the tests in any direction. However, looking at the frequency of the items missed it does appear that the more difficult items were those that occurred in the latter parts of the subtest.

4. On those items in a subtest where a large number of examinees failed, there was evidence of guessing as indicated by the distribution of responses of the discriminators. For mathematics tests in graphing, algebra, and trigonometry this was especially true. There was no evidence to suggest that cheating had any effect on the results.

5. There was no evidence to suggest that situational variables related to test administration had any effect on the results.

6. There were deficiencies in the manner that some test items were physically presented. In particular the page set-up was sometimes confusing and the graphics were not always clear.

Recommendations and Conclusions

Based on the validation effort to date the following recommendations and conclusions are offered:

1. Of the 128 BSEP subtests developed and submitted to initial validation efforts, 109 show sufficient congruency between locator and subtest that each can be considered for use as designed for BSEP 1 populations. However, prior to utilization the following is recommended:

   a. Cut scores be established for the various subtests and MOS via the Angoff method. If this is not practicable it is recommended the cut scores be set administratively based on resources available and the stated purposes and goals of current or planned remedial programs.

   b. Revised prediction charts be established for locator and subtests. These charts would use data available from the effort reported on herein.

   c. For the nineteen (19) subtests not considered for further use (specifically identified on page 27.2 of the MOS Test Validation Report), further administration should be completed in an attempt to investigate the relationship between the locator and subtest.

2. The current study demonstrated the congruence between the locator and the BSEP subtests for a general sample of BSEP 2 soldiers. If BSEP locator and subtests are to be used as designed, then additional studies are needed within aptitude areas with BSEP 2 soldiers. These studies can be conducted by specifying administration of the tests as part of ongoing training activities.

3. The current study demonstrated a strong relationship between the BSEP math locator and the ASVAB arithmetic reasoning, mathematics knowledge and numerical operations subtests; the BSEP verbal locator and the ASVAB paragraph comprehension and word knowledge subtests; and the sum of the BSEP math and verbal locator scores and ASVAB composite scores (for the appropriate aptitude area). To the extent that these ASVAB subtests are predictive of training and job success for selected MOS, the BSEP locators and the respective subtests can be used for diagnostic, remedial training purposes.

4. As shown on page 68 of the MOS Test Validation Report, forty-seven (47) BSEP subtests demonstrated weak or no relationships with the ASVAB subtests. It is recommended that these subtest data be further analyzed to determine if an interactive relationship exists based on either level of ASVAB scores or on levels of BSEP scores when various BSEP subtests are combined.

5. The current study used specially developed structured response exercises to investigate the relationship between the BSEP locator and subtests and a more "performance - oriented" criterion. The main assumption was that structured response items (derived from the BSEP subtests) more closely represented the job environment than did the selected response mode of the BSEP subtests. This assumption needs to be investigated further by both expert judgement and item analysis techniques. Presently the BSEP math and verbal locator tests bear a moderate to high relationship with the structured response scores. Little relationship is demonstrated between the criterion verbal subtests and BSEP verbal subtests.

6. Additional studies of criterion - related and predictive validity are needed for both BSEP 1 and BSEP 2 populations. Several areas of inquiry which can be pursued without changes in remedial training programs are as follows:

   a. What is the relationship between scores on the BSEP locator tests and subtests and success in IET?

   b. What is the relationship between scores on the BSEP locator tests and subtests and success in training beyond IET?

   c. What is the relationship between scores on the BSEP locator tests and subtests and scores obtained on subsequent administration of the ASVAB?

   d. What is the relationship between scores on the BSEP locator tests and subtests and measures of success on the job?

FIGURE 1
LOCATOR/SUBTEST CORRELATION - MATH

BSEP 1 - ALL APTITUDE AREAS

SUBTEST GROUP	NU	CO	SP	ME	GR	AL	TR
RANGE OF CORRELATIONS							
.89 - .80	2	3				1	
.79 - .70	38	28	1	22	1		
.69 - .60	33	47	14	50	6	5	
.59 - .50	19	30	34	70	9	3	
.49 - .40	13	8	36	35	2	7	1
.39 - .30	2	3	11	12	1	1	5
.29 - .20	1	8	2	8	6	1	9
.19 - .10		8	1		2		20
.09 - .00				1			1
TOTAL SUBTESTS	108	135	99	198	27	18	36

FIGURE 2
LOCATOR/SUBTEST CORRELATION - MATH

BSEP 2 - ALL APTITUDE AREAS

SUBTEST GROUP	NU	CO	SP	ME	GR	AL	TR
RANGE OF CORRELATIONS .89 - .80							
.79 - .70	5	5		2			
.69 - .60	6	4	3	9	1	1	
.59 - .50		4	3	5			
.49 - .40	1		3	4	1	1	
.39 - .30			2	2			1
.29 - .20		2			1		1
.19 - .10							1
.09 - .00							1
TOTAL SUBTESTS	12	15	11	22	3	2	4

FIGURE 3
LOCATOR/SUBTEST CORRELATION - VERBAL

BSEP 1 - ALL APTITUDE AREAS

SUBTEST GROUP	PD	VO	PS	IC	IL	PC	SC	FO	NT	OU	PW	ED	VC	FR	RE
RANGE OF CORRELATIONS .89 - .80															
.79 - .70						1									
.69 - .60	11	5	1	5	2	5		1		2	14	7	2		
.59 - .50	29	15	2	9	2	8		7	7	3	24	20	11		
.49 - .40	11	15	5	6	9	2	7	11	8	6	23	23	10	6	2
.39 - .30	2	6	15	7	11	2	1	6	2	6	5	20	3	2	8
.29 - .20	1	3	7	5	4		1	2	1	1	6		1	5	18
.19 - .10		1	3	2	6							2		4	11
.09 - .00			3	2	2									1	6
TOTAL SUBTESTS	54	45	36	36	36	18	9	27	18	18	72	72	27	18	45

FIGURE 4
LOCATOR/SUBTEST CORRELATION - VERBAL

BSEP 2 - ALL APTITUDE AREAS

SUBTEST GROUP	PD	VO	RS	TC	IL	FC	SC	FD	NT	OU	RW	ED	VC	PR	RE
RANGE OF CORRELATIONS .89 - .80															
.79 - .70											1				
.69 - .60	3			1		1		1	1		2	1	2		
.59 - .50	2	4		1		1	1			1	4	4	1		
.49 - .40	1		2	1	2					1		1			1
.39 - .30		1	1	1	1			1	1		1	2		2	1
.29 - .20			1		1			1							2
.19 - .10															1
.09 - .00															
TOTAL SUBTESTS	6	5	4	4	4	2	1	3	2	2	8	8	3	2	5

FIGURE 5

BSEP/ASVAB CORRELATIONS

ASVAB - NUMERICAL SUBTESTS (AR + MK + NO)

	CL	CO	EL	FA	GM	MM	OF	SC	ST
MATH LOCATOR	.72	.70	.66	.71	.66	.72	.67	.70	.73

ASVAB - VERBAL SUBTESTS (VE = PC + WK)

	CL	CO	EL	FA	GM	MM	OF	SC	ST
VERBAL LOCATOR	.62	.66	.65	.74	.60	.67	.61	.69	.60

ASVAB COMPOSITES

	CL	CO	EL	FA	GM	MM	OF	SC	ST
TOTAL LOCATOR	.46	.68	.76	.78	.67	.65	.67	.54	.74

AD-A143 617 NEEDS ASSESSMENT TO DEFINE THE TRAINING REQUIREMENTS FOR A BASIC SKILLS E.. (U) RCA SERVICE CO CHERRY HILL NJ JUN 84 DABT60-81-C-0017 2/2

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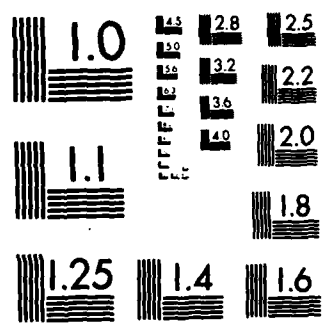


FIGURE 6
LOCATOR/PERFORMANCE SUBTEST CORRELATION
MATH
BSEP 1 - ALL APTITUDE AREAS

SUBTEST GROUP	NU	CO	SP	ME	GR	AL	TR
RANGE OF CORRELATIONS							
.89 - .80					1		
.79 - .70	6	5	1	4			
.69 - .60	2	5	2	6		2	
.59 - .50	2	4	4	7	1		
.49 - .40	1	1	1	3			
.39 - .30	1		1	1			2
.29 - .20			2	1	1		
.19 - .10							1
.09 - .00							1*
TOTAL SUBTESTS	12	15	11	22	3	2	4

* NOT WITHIN .05 SIGNIFICANCE

FIGURE 7

LOCATOR/ PERFORMANCE SUBTEST CORRELATION - VERBAL

BSEP I - ALL APTITUDE AREAS

SUBTEST GROUP	PD	VO	RS	TC	IL	FC	SC	FO	NT	OU	RW	ED	VC	PR	RE
RANGE OF CORRELATIONS															
.89 - .80															
.79 - .70															
.69 - .60	1	1		1		1		1			1	2			
.59 - .50	2	1	2	1		1	1				2				
.49 - .40	3	2	1					1	1	2	2	4	1		2
.39 - .30			1		1			1			2	1	1		1
.29 - .20				2	2							1	1	1	2
.19 - .10		1*			1*				1		1				
.09 - .00														1*	
TOTAL SUBTESTS	6	5	4	4	4	2	1	3	2	2	8	8	3	2	5

* NOT WITHIN .05 SIGNIFICANCE

FIGURE 8
BSEP SUBTEST/PERFORMANCE SUBTEST CORRELATION
MATH
BSEP 1 - ALL APTITUDE AREAS

SUBTEST GROUP	NU	CO	SP	ME	GR	AL	TR
RANGE OF CORRELATIONS .89 - .80							
.79 - .70							
.69 - .60	2	1		1			
.59 - .50	3	3	1	2	1		
.49 - .40	1	4	2	3		1	
.39 - .30	4	3	3	7	1		
.29 - .20		2		4			
.19 - .10	2*	1*	2	3*		1	1*
.09 - .00		1*	3*	2	1*		3*
TOTAL SUBTESTS	12	15	11	22	3	2	4

* CONTAINS VALUES NOT WITHIN .05 SIGNIFICANCE

FIGURE 9

BSEP SUBTEST/ PERFORMANCE SUBTEST CORRELATION - VERBAL

BSEP I - ALL APTITUDE AREAS

SUBTEST GROUP	PD	VO	RS	TC	IL	FC	SC	FO	NT	OU	RW	ED	VC	PR	RE
RANGE OF CORRELATIONS															
.89 - .80															
.79 - .70															
.69 - .60															
.59 - .50															
.49 - .40	1										2				
.39 - .30	3	3	1	2		1		1			1	2			
.29 - .20	2		1			1	1	1		1*	2	2	1		1
.19 - .10		1*			2*			1*			2*	3*	2	1	1*
.09 - .00		1*	2*	2*	2*				2*	1*	1*	1*		1*	3*
TOTAL SUBTESTS	6	5	4	4	4	2	1	3	2	2	8	8	3	2	5

* CONTAINS VALUES NOT WITHIN .05 SIGNIFICANCE

ATTACHMENT A

Test Title Listing

NUMERIC

1.	NU 1	NUMERICAL: Matching numbers with word names and models
2.	NU 2	NUMERICAL: Place value
3.	NU 3	NUMERICAL: Ordinal use of numbers
4.	NU 4	NUMERICAL: Counting and sequences of numbers
5.	NU 5	NUMERICAL: Ordering numbers
6.	NU 6	NUMERICAL: Points and intervals on a number line
7.	NU 7	NUMERICAL: Equivalent fractions
8.	NU 8	NUMERICAL: Equivalence among fractions, decimals, percents, mixed numbers
9.	NU 9	NUMERICAL: Ratio and proportion
10.	NU 10	NUMERICAL: Exponents
11.	NU 11	NUMERICAL: Scientific notation
12.	NU 12	NUMERICAL: Rounding numbers

COMPUTATION

13.	CO 1	COMPUTATION: Addition and subtraction of whole numbers
14.	CO 2	COMPUTATION: Multiplication and division of whole numbers
15.	CO 3	COMPUTATION: Addition and subtraction of fractions
16.	CO 4	COMPUTATION: Multiplication and division of fractions
17.	CO 5	COMPUTATION: Addition and subtraction of decimals
18.	CO 6	COMPUTATION: Multiplication and division of decimals
19.	CO 7	COMPUTATION: Addition and subtraction of integers
20.	CO 8	COMPUTATION: Multiplication and division of integers
21.	CO 9	COMPUTATION: Combinations of operations
22.	CO 10	COMPUTATION: Averages (arithmetic mean)
23.	CO 11	COMPUTATION: Approximate numbers
24.	CO 12	COMPUTATION: Estimation
25.	CO 13	COMPUTATION: Evaluation of formulas
26.	CO 14	COMPUTATION: Computation using measures
27.	CO 15	COMPUTATION: Median and mode

SPATIAL

28.	SP 1	SPATIAL: Orientation in space
29.	SP 2	SPATIAL: Rotation and reflection
30.	SP 3	SPATIAL: Parallel and perpendicular lines and planes
31.	SP 4	SPATIAL: Comparison of shapes and sizes of geometric figures
32.	SP 5	SPATIAL: Schematic diagrams
33.	SP 6	SPATIAL: Interpretation of three-dimensional models
34.	SP 7	SPATIAL: Meaning of spatial terms
35.	SP 8	SPATIAL: Common geometric figures and their properties
36.	SP 9	SPATIAL: Meaning of technical terms
37.	SP 10	SPATIAL: Visual comparison of sizes of geometric figures
38.	SP 11	SPATIAL: Matching and alignment of figures

MEASUREMENT

39.	ME 1	MEASUREMENT: Common units of measure
40.	ME 2	MEASUREMENT: Telling time
41.	ME 3	MEASUREMENT: Use of Julian calendar
42.	ME 4	MEASUREMENT: Angles
43.	ME 5	MEASUREMENT: Bearings and azimuths
44.	ME 6	MEASUREMENT: Estimation of linear measures not more than 6 inches
45.	ME 7	MEASUREMENT: Estimation of linear measures greater than 6 inches
46.	ME 8	MEASUREMENT: Visual comparisons of measures
47.	ME 9	MEASUREMENT: Solving measurement problems
48.	ME 10	MEASUREMENT: Perimeter, area and volume
49.	ME 11	MEASUREMENT: Conversion of measures
50.	ME 12	MEASUREMENT: Circumference and area of circles
51.	ME 13	MEASUREMENT: Number of parts of a linear scale
52.	ME 14	MEASUREMENT: Markings on a linear scale
53.	ME 15	MEASUREMENT: Estimating readings on a scale
54.	ME 16	MEASUREMENT: Reading a scale that is not numerically calibrated

MEASUREMENT (continued)

55.	ME 17	MEASUREMENT: Reading a ruler
56.	ME 18.	MEASUREMENT: Reading ammeters, voltmeters, and related scales
57.	ME 19	MEASUREMENT: Reading simple gauges
58.	ME 20	MEASUREMENT: Reading vernier, micrometer, and related scales
59.	ME 21	MEASUREMENT: Reading an oscilloscope
60.	ME 22	MEASUREMENT: Reading a logarithmic scale

GRAPHING

61.	GR 1	GRAPHING: Coordinates of a point in a grid system
62.	GR 2	GRAPHING: Points on a line graph
63.	GR 3	GRAPHING: Matching a graph with its equation

ALGEBRA

64.	AL 1	ALGEBRA: Equivalent algebraic expressions
65.	AL 2	ALGEBRA: Evaluation and estimation of powers and roots

TRIGONOMETRY AND LOGARITHMS

66.	TR 1	TRIGONOMETRY: Basic trigonometric ratios
67.	TR 2	TRIGONOMETRY: Use of tables of trigonometric functions
68.	TR 3	TRIGONOMETRY: Problems using trigonometric ratios
69.	TR 4	TRIGONOMETRY: Use of logarithmic tables
70.		Mathematics LOCATOR TEST

PROCEDURAL DIRECTIONS OR PROSE

1.	PD 1	PROCEDURAL DIRECTIONS OR PROSE: Factual details
2.	PD 2	PROCEDURAL DIRECTIONS OR PROSE: Relevant and irrelevant information
3.	PD 3	PROCEDURAL DIRECTIONS OR PROSE: Sequence and detail
4.	PD 4	PROCEDURAL DIRECTIONS OR PROSE: Essential message
5.	PD 5	PROCEDURAL DIRECTIONS OR PROSE: Inferences
6.	PD 6	PROCEDURAL DIRECTIONS OR PROSE: Information from multiple sources

VOCABULARY

7.	VO 1	VOCABULARY: Common words
8.	VO 2	VOCABULARY: Technical words
9.	VO 3	VOCABULARY: Words in context
10.	VO 4	VOCABULARY: Contractions and abbreviations
11.	VO 5	VOCABULARY: Figurative, idiomatic, and technical terms in context

REFERENCE SKILLS

12.	RS 1	REFERENCE SKILLS: Code number and title of source documents
13.	RS 2	REFERENCE SKILLS: Alphabetical order
14.	RS 3	REFERENCE SKILLS: Table of contents and index
15.	RS 4	REFERENCE SKILLS: Appendix and glossary

TABLES/CHARTS

16.	TC 1	TABLES/CHARTS: Two-column charts
17.	TC 2	TABLES/CHARTS: Three or more column charts
18.	TC 3	TABLES/CHARTS: Cross referencing
19.	TC 4	TABLES/CHARTS: Troubleshooting

ILLUSTRATIONS OR DIAGRAMS

20.	IL 1	ILLUSTRATIONS OR DIAGRAMS: Pictorial details
21.	IL 2	ILLUSTRATIONS OR DIAGRAMS: Keys and legends
22.	IL 3	ILLUSTRATIONS OR DIAGRAMS: Sequence
23.	IL 4	ILLUSTRATIONS OR DIAGRAMS: Symbols

FLOW CHARTS

24.	FC 1	FLOW CHARTS: Organization charts
25.	FC 2	FLOW CHARTS: Linear paths

SCHEMATICS

26.	SC 1	SCHEMATICS: Schematic diagrams

FORMS

27.	FO 1	FORMS: Entering information
28.	FO 2	FORMS: Accuracy of statements
29.	FO 3	FORMS: Locating information

NOTE-TAKING

30.	NT 1	NOTE-TAKING: Essential details
31	NT 2	NOTE-TAKING: Accuracy

OUTLINING

32.	OU 1	OUTLINING: Organization
33.	OU 2	OUTLINING: Format

REPORT WRITING

34.	RW 1	REPORT WRITING: Intent
35.	RW 2	REPORT WRITING: Descriptions of events
36.	RW 3	REPORT WRITING: Sequence of events
37.	RW 4	REPORT WRITING: Impressions of events
38.	RW 5	REPORT WRITING: Clarification of issues
39.	RW 6	REPORT WRITING: Supporting and opposing evidence
40.	RW 7	REPORT WRITING: Accuracy of summaries
41.	RW 8	REPORT WRITING: Justifications for actions

EDITING

42.	ED 1	EDITING: Spelling of common words
43.	ED 2	EDITING: Spelling of task-related words

EDITING (continued)

44.	ED 3	EDITING: Capitalization
45.	ED 4	EDITING: Endmarks, commas, and apostrophes
46.	ED 5	EDITING: Mechanics of grammar
47.	ED 6	EDITING: Paragraph organization
48.	ED 7	EDITING: Clarity
49.	ED 8	EDITING: Complete sentences

VERBAL COMMUNICATION

50.	VC 1	VERBAL COMMUNICATION: Appropriate language
51.	VC 2	VERBAL COMMUNICATION: Appropriate type of communication
52.	VC 3	VERBAL COMMUNICATION: Clarity of directions

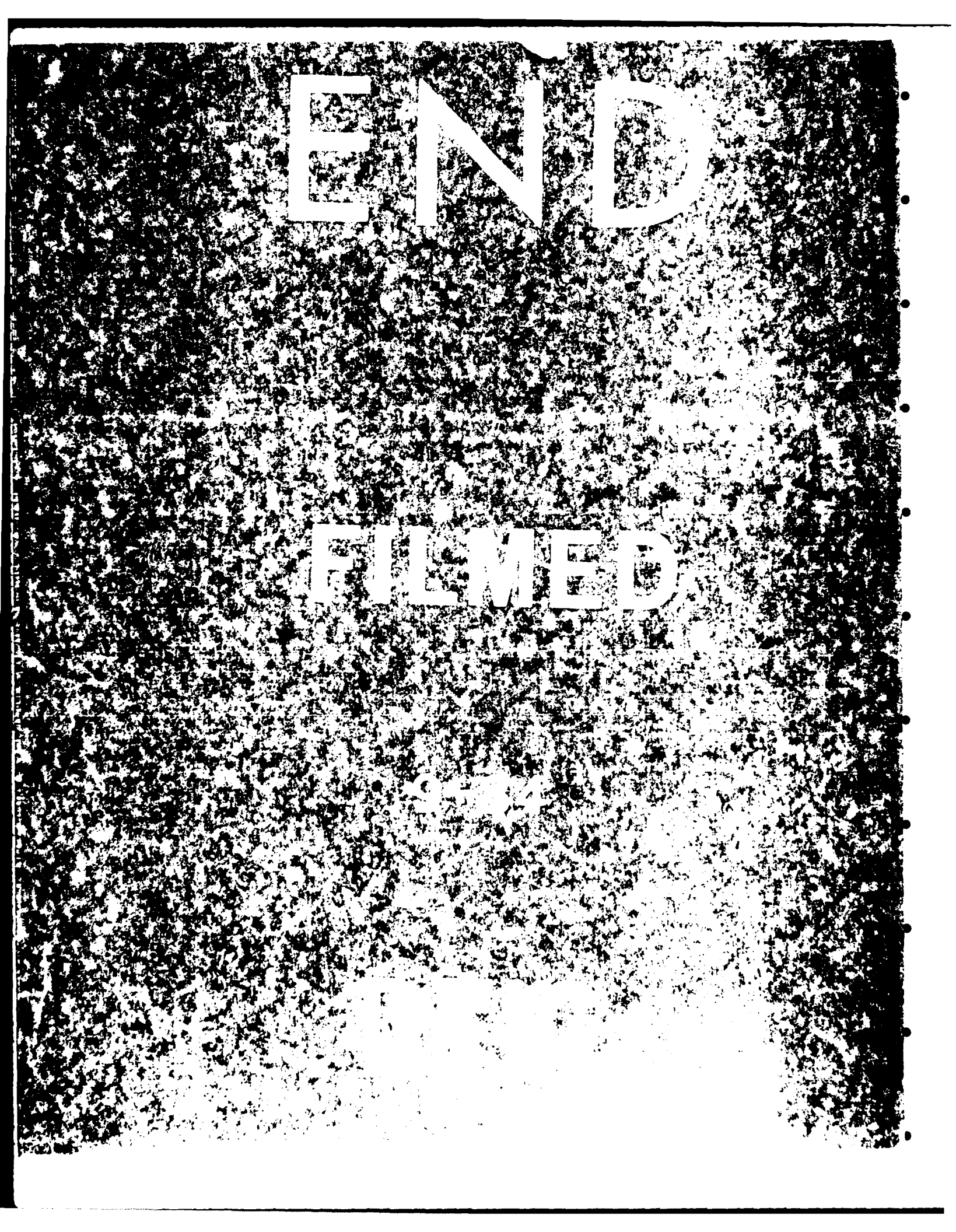
PRECAUTIONS

53.	PR 1	PRECAUTIONS: Safety hazards
54.	PR 2	PRECAUTIONS: Emergency actions

RECOGNITION

55.	RE 1	RECOGNITION: Similarities of objects
56.	RE 2	RECOGNITION: Recognizing motions and gestures
57.	RE 3	RECOGNITION: Damage and defects
58.	RE 4	RECOGNITION: Matching objects
59.	RE 5	RECOGNITION: Classifying objects

Verbal LOCATOR TEST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